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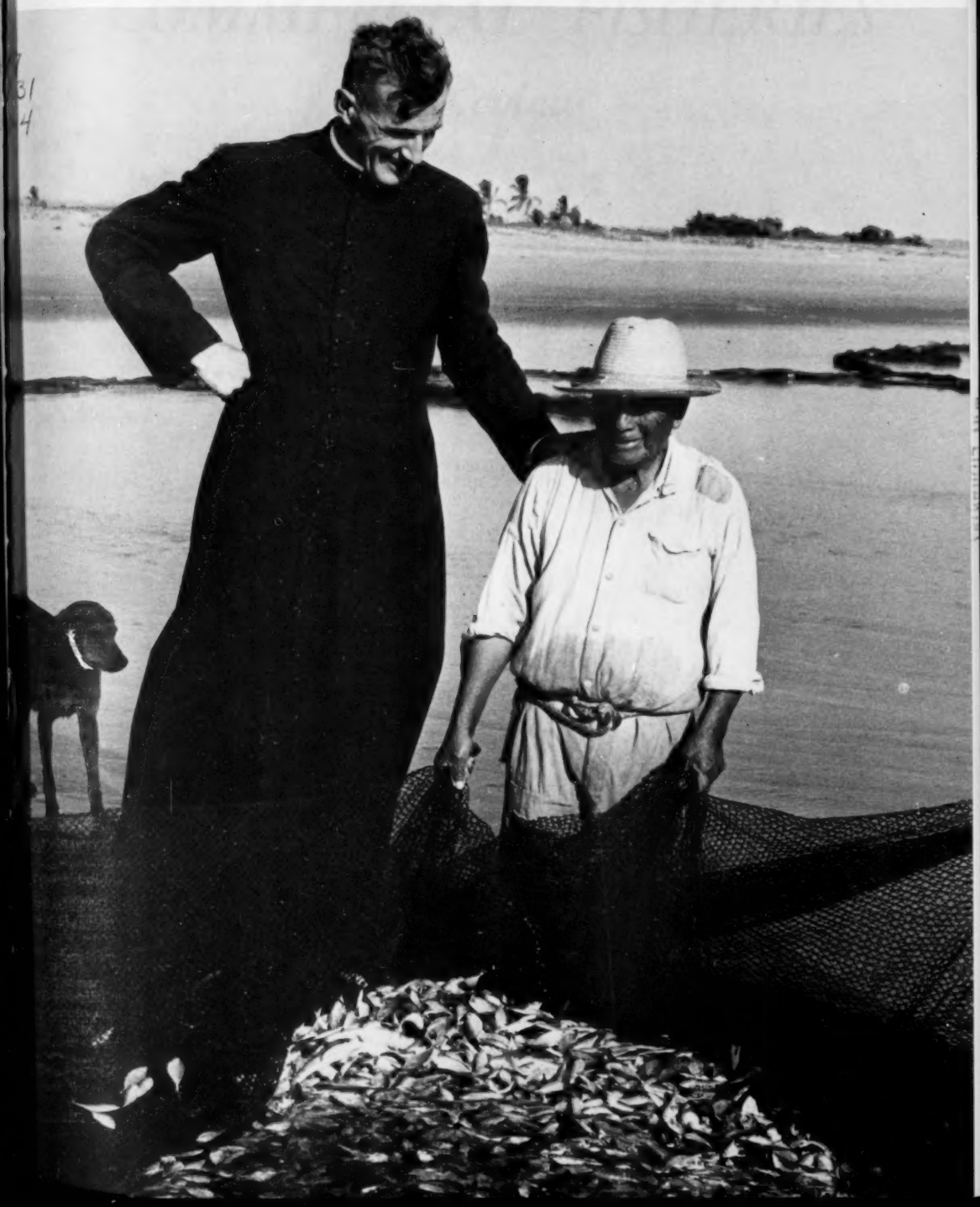
COMMERCIAL FISHERIES Review

VOL. 31, NO. 4 APRIL 1969



COVER: Priest of small village in Ecuador and fishermen examine catch--mostly small herringlike fish--made with beach seine. (FAO Photo: S. Larrain)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

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The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

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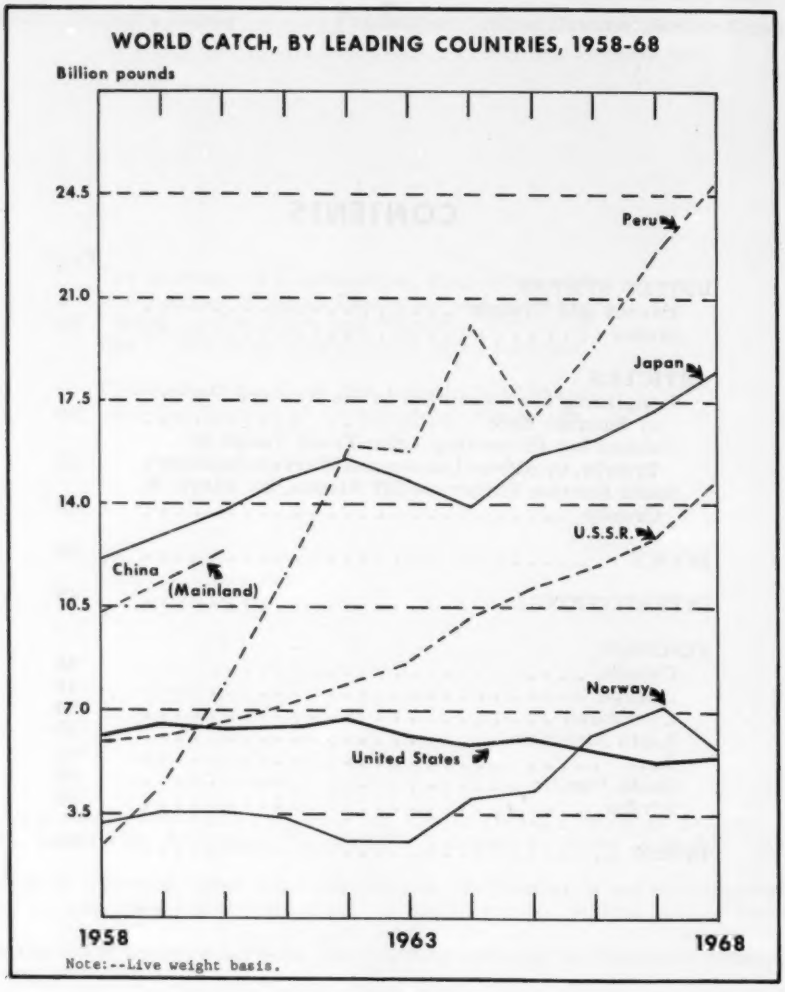
CONTENTS

	Page
UNITED STATES	
Events and Trends	1
States	25
ARTICLES	
Longlining for Swordfish in the Eastern Pacific, by Susumu Kato	30
Method for Protecting Lake Trout Taken in Trawls, by Alfred Larsen and Warren Handwork	33
South Korean Fisheries Off Alaska, by Virgil N. Crosby	36
BOOKS	39
INTERNATIONAL	43
FOREIGN	
Canada	48
Europe	49
Caribbean	58
Latin America	59
Asia	61
South Pacific	65
Africa	65
INDEX	69


WORLD CATCH, BY LEADING COUNTRIES, 1958-68
Billion pounds
24.5
21.0
17.5
14.0
10.5
7.0
3.5
Peru
Japan
U.S.S.R.
China
(Mainland)
Norway
United States
1958
1963
1968
Note:--Live weight basis.

U.S. FISHERMEN CAUGHT 4.1 BILLION POUNDS IN 1968 WORTH $471.5 MILLION

In 1968, U.S. fishermen caught 4.1 billion pounds of fishery products, which they sold for $471.5 million. This was almost $32 million more than their 1967 sales--and nearly equal to the record $472.4 million they received for their larger 1966 catch of 4.4 billion pounds. These data are contained in BCF's "Fisheries of The United States. . . 1968."

Declining sharply were landings of anchovies, haddock, Pacific hake, tuna, blue crabs, and king crabs.

Also lower were catches of alewives, Pacific halibut, and shrimp.

The total catch would have dropped below 1967's except for greater landings of menhaden, Pacific salmon, sea herring, jack mackerel, and yellowtail flounders. And there were record catches of shrimp in Maine and Oregon waters, albacore tuna off Oregon, and northern and spiny lobsters.

How Catch Was Used

In 1968, about 2.3 billion pounds of the domestic catch were used as food for people.

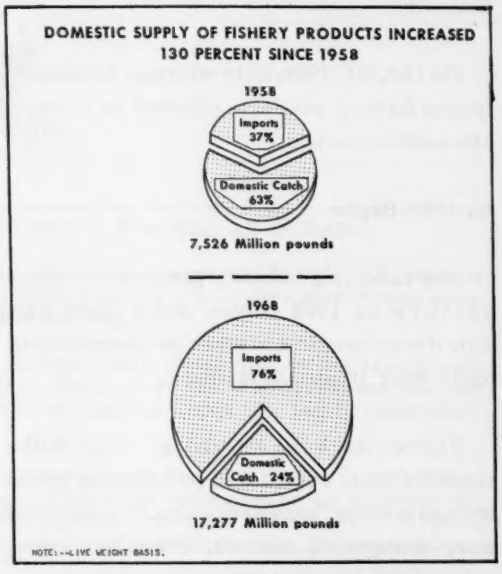
The total 1968 catch for food was marketed as follows: 1,503 million pounds (round weight) fresh and frozen; 970 million for canning (includes animal food); 76 million for cured products; and 1,567 million for reduction to meal, oil, etc.

Record 11.46¢ A Pound

In 1968, the average price-per-pound paid to fishermen hit a record 11.46 cents. In 1967, it had been 10.84; in 1966, 10.81 cents.

PROCESSED FISHERY PRODUCTS

The value of U.S.-processed fishery products from domestic and imported raw material was $1.3 billion--about 7% above 1967.



The canned pack of 43.4 million standard cases was worth a record $580.6 million.

Record packs of tuna and pet food were achieved. There were large increases in canned production of Pacific salmon, Maine sardines, mackerel, and shrimp.

The fish stick and portion industry set records: 270.7 million pounds worth $108.8 million.

Processors of breaded shrimp produced 103.7 million pounds worth a record $98.5 million.

Groundfish-fillet production was less than in 1967, "but producers of other type fillets had a relatively good year."

Processors of fish and shellfish specialty dinners--and other packaged products--produced more. Continued industry growth was indicated.

On Oct. 31, 1968, cold-storage holdings of frozen fishery products climbed to a record 288 million pounds.

As 1969 Began

The fishing industry presented a mixed picture as 1969 began: some parts were mired in economic and other problems; many parts were in excellent shape.

Fishermen were receiving a high dollar value for their catch. The processing industry was making "excellent gains." Americans were eating more seafood. There was strong demand throughout 1968 for "some canned products, fish sticks and portions, fillets and steaks, lobster products, shrimp items, and fish and shellfish specialty dinners, etc."

Per-capita consumption reached 11 pounds in 1968, the highest since 1954.

IMPORTS

In 1968, the U.S. imported 13.2 billion pounds (live weight) of all fishery products, far exceeding 1967's high of 9.9 billion pounds.

The value of imports was $798 million, $90 million higher than the 1966 record of $708 million.

Of the 13.2 billion pounds, 3.2 billion were edible fishery products; 10 billion were industrial fishery products (33% above 1967's record 7.5 billion).

SOME HIGHLIGHTS

- Domestic shrimp fishermen were paid a record $113.3 million for their catch. For the second consecutive year, this fishery exceeded $100 million.

- Shrimp accounted for 24% of the total U.S. value paid for all species.

- The menhaden catch of 1.4 billion pounds was 34% of total catch.

- Louisiana led all States in volume of catch--747.5 million pounds. It was followed by California, 446.1 million pounds; Alaska, 433.7 million pounds; Virginia, 388.5 million pounds; and Massachusetts, 337.4 million pounds.

- Alaska was No. 1 in value of catch: $71.6 million. Then came California, $53.3 million; Texas, $44.2 million; Massachusetts, $41.6 million; and Louisiana, $40.6 million.

• For the 20th consecutive year, San Pedro, California, led all domestic fishing ports in value of catch: $29.1 million.

• U.S. foreign trade in fishery products was a record $865.8 million in 1968--up $75.7 million.

• A new and potentially important Alaska sea-scallop fishery began in 1968. Nearly 2 million pounds of sea scallop meats were landed.

• In 1968, construction of shrimp trawlers continued at a record pace. At least 350 new vessels joined the Gulf shrimp fleet.

WORLD FISHING

Peru led the world in fishery landings--followed by Japan, China (Mainland), USSR, Norway, and U.S. But world ranking by value is considerably different. Here, Japan leads, followed by the U.S. Peru ranks about 15th, and the USSR might be lower.

Japan led the world in per-capita consumption of fishery products with 61.2 pounds of edible meat. Then came Denmark, 47.5; Sweden, 45.1; Norway and Portugal, 43.4 each; the Philippines, 33.8.

WHAT IS THE DIFFERENCE BETWEEN A SEA AND AN OCEAN?

The terms "sea" and "ocean" are often used interchangeably in referring to salt water. However, from a geographic point of view, a sea is a body of water that is substantially smaller than an ocean or is part of an ocean.

The term "seven seas" dates back to ancient times, referring to the seas known to the Mohammedans before the 15th century. These were the Mediterranean Sea, the Red Sea, the East African Sea, the West African Sea, the China Sea, the Persian Gulf, and the Indian Ocean.

In more recent times, Rudyard Kipling popularized the expression "seven seas" by using it as the title of a volume of poems. There has been a tendency to divide the world's ocean into seven oceans to retain this legendary number. The popular division is Arctic, North Atlantic, South Atlantic, North Pacific, South Pacific, Indian, and Antarctic. However, International Hydrographic Bureau at Monaco does not accept the existence of an Antarctic Ocean. Actually, of course, all limits of oceans are arbitrary, as there is only one global sea. The International Hydrographic Bureau subdivisions are primarily for the purpose of filing Notices to Mariners and have little to do with natural boundaries.

The International Hydrographic Bureau lists 54 seas; some are seas within seas. The Mediterranean Sea contains seven seas so one could sail the seven seas (of the Mediterranean) without ever venturing into an ocean. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

UNITED STATES

Gloucester Herring-Alewife Fishery Rises Sharply

Prior to 1967, the herring-alewife catch landed at Gloucester, Mass., was relatively small. During 1967 and 1968, however, one firm operated a reduction plant at Gloucester using these species caught by U.S. and foreign vessels. As a result, the annual catch has risen sharply:

	Catch		
	Alewife	Herring	Total
	(Million Pounds)		
1965	0.006	-	0.006
1966	0.006	0.001	0.007
1967	4.246	11.741	15,987
1968	-	53.727	53.727

1968 Herring Catches

In 1968, 21,037,000 pounds of herring were taken by U.S. vessels, 32,320,000 pounds by Canadian vessels, and 370,000 pounds by an Icelandic seiner. The Canadian and Icelandic catches were transferred at sea for delivery to the Gloucester firm.

The Canadian vessels are 100-foot-class combination purse seiners-otter trawlers, equipped with power blocks and sonar. These vessels fish with a seine skiff and fish seines 40 to 50 fathoms deep, and 250 to 350 fathoms long. The Icelandic vessel used a 120-fathom-deep purse seine.

BCF Explorations

In April, BCF's exploratory fishing research vessel 'Delaware II' conducted surveys to locate and sample commercial abundance of herring and red hake concentrations. Surveys and experimental fishing were carried out with a midwater trawl and a high-opening bottom trawl.

Study Spring Spawning of Georges Bank Haddock

The 1969 spring spawning of Georges Bank haddock was followed carefully by BCF's Woods Hole (Mass.) Laboratory. A sampling schedule was set for January-July with weekly samples from the commercial fleet and from BCF's 'Albatross IV'. Arrangements were made with Boston trawler skippers to supply fish landed in the round to provide gonads for examination.

Observations Began in 1968

The study continues observations begun in 1968. It was noted then that peak spawning did not occur until late April. This was considerably later than indicated by plankton surveys in previous years.

The Georges Bank haddock stock is in serious condition because of low survival of year-classes for the past 5 years. The cause is unknown. An intensive study of spawning process and fate of the spawn is essential to understand recruitment of fish to the fishery. The examination of gonads during spawning season is an important part of study.

Demand for Ocean Quahogs Grows

There is growing interest in the supply and use of ocean quahogs, Artica islandica. This is due to the success of a Rhode Island firm in using the ocean quahogs in its products--and to experiments at BCF's Gloucester (Mass.) Technological Laboratory. The experiments showed these clams to have potential food uses. The lab has received inquiries from several firms.

State Interested

Massachusetts is interested in the potential and promotion of ocean quahogs. The State had learned of the work by BCF's Exploratory Fishing and Gear Research Base and the lab

to find the resource, prepare acceptable products, and to promote the species. State officials agreed to work with the lab to acquaint coastal towns of the ocean quahog fishery potential.

The 'Clambo'

BCF staff participated in the first public showing of a product made from minced ocean quahog held together as a pattie. The binder was produced from pulverized fish flesh, the 'clambo'. The clambo's flavor can be controlled by varying the amount of quahog, starch, and spices--and by varying particle size of components.

BCF's 'Oregon II' Finds Heavy Fish Concentrations Off Louisiana

During 4 weeks of exploration off Louisiana, BCF's Oregon II recorded heavy echo-sounder indications of schools of rough scad and round herring. The schools were located just off the bottom in 110 fathoms depth south of Cameron and extended for 35 miles.

Salmon & Steelhead Trout Culture Practiced

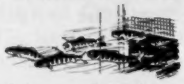
Aquatic husbandry is practiced in many ways with varying success. Among the most successful is the Federally supported hatchery system on the lower Columbia River. This releases young salmon and steelhead to be caught later by commercial and sport fishermen.

In 1967 alone, BCF estimates, the hatchery program contributed well over 15 million pounds to catches in the Columbia and off the west coast. The cost of producing the fish was less than half their value when caught.

Program Improvement Possible

A BCF study indicates that catches could be increased by 10.5 million pounds a year if existing hatchery stations and techniques were used to full capacity. The cost would be about one-sixth the resulting annual value; it would be lowered further as research findings and new techniques were applied.

BCF provides funds and administers the program, which is conducted cooperatively with Oregon, Washington, and Interior's Bureau of Sport Fisheries and Wildlife.



Record Stocking of Fish in Great Lakes Scheduled

About 11.7 million hatchery-reared fish, principally salmon and lake trout, were scheduled to be planted in the Great Lakes in spring 1969. This will be more than 3 million above the 1968 high, according to the Great Lakes Commission.

Two major agencies are trying to rebuild the sport and commercial fish stocks: Michigan's Department of Natural Resources, which will release about 5.2 million salmon and steelhead (rainbow) trout, and the Great Lakes Fishery Commission, which will direct planting of 5.1 million lake trout. Also, the spring stocking programs of conservation agencies in New York, Ohio, Pennsylvania, and Wisconsin will include larger salmon plantings than their 1968 introductory releases, and the stocking of other game fish. Minnesota and Ontario will make their first coho plantings.

Where Released

Michigan's record-level fish-planting program will involve 41 streams tributary to lakes Michigan, Superior, and Huron. The coho salmon release of 3,950,000 smolt (yearlings) will go into 26 streams: Lake Michigan 2.9 million; Lake Superior 500,000; Lake Huron 550,000.

For the 900,000 young chinook salmon, the plantings by lake basin will be: Michigan 650,000; Huron 200,000; Superior 50,000.

The schedule for 320,000 steelheads or lake-run rainbow trout calls for releases in 22 streams: Michigan 205,000; Superior 55,000; Huron 60,000.

Lake Trout

The lake trout yearlings will be planted in lakes Superior and Michigan by the U.S.

Bureau of Sport Fisheries and Wildlife, and Minnesota, Wisconsin, and Ontario fishery agencies. The release of 3,097,000 trout in Superior will mark the fourth consecutive year over the 3-million mark. For Lake Michigan, 1969 is the first since the planting program began in 1965 that the number of trout released will be over 2 million (2,040,000). The waters of all four states bordering the lake will share this year's plantings.

Erie & Ontario

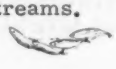
In the eastern Great Lakes--Erie and Ontario--last year's successful introduction of 143,000 cohos by Ohio, Pennsylvania, and New York has led these states to increase plantings to about 365,000 this spring. Ohio plantings in 4 locations will total about 95,000; in addition, 25,000 young rainbows will go into Lake Erie tributaries in the eastern section of the state. For Pennsylvania's Lake Erie streams, the release of coho smolt is expected to be about 125,000. New York coho plantings will total 145,000 fish: about 10,000 in a Lake Erie tributary. the remainder into impoundments on 3 Lake Ontario streams. The state also plans to release about 60,000 chinook salmon fingerlings in the Little Salmon River at the east end of Lake Ontario.

Ontario Province

The Province of Ontario will undertake its first coho plantings in the Great Lakes: 130,000 are scheduled for 3 streams at the west end of Lake Ontario; 20,000 will be placed in the Nipigon Bay area of Lake Superior. In addition to coho, the province will plant 35,000 splake (a lake trout-brook trout hybrid) in Georgian Bay, and rainbow trout in several Great Lakes areas.

Minnesota & Wisconsin

Minnesota's first coho release, about 100,000 yearlings, will be made in the French River, a Lake Superior tributary near Duluth. Wisconsin's initial planting of 25,000 coho in one Lake Michigan stream in 1968 will be expanded this spring to 5 streams; each will receive about 40,000 yearlings. Also, the state plans to place a total of 200,000 rainbow, brown and brook trout in Lake Michigan tributaries, and about the same number in Lake Superior streams.



East Coast Aquatic Plant Harms Clams and Oysters

A dark-green, cylindrical algae resembling forked macaroni appeared in 1957 at the eastern end of Long Island. Some fishermen call it 'spagetti weed.' Because it is a cold-water plant, it differs from the Codium (C. decorticatum) of the temperate and tropical waters of the east coasts of North and South America.

This plant grows so luxuriously it blankets the bottom and interferes with and destroys clams and oysters. It crowds out all other species. By 1962, it was observed near the mouth of Narragansett Bay and, later, in the Chatham and Cotuit areas of Cape Cod. The rizoids ('rootlets') or 'hold fasts' attach to hard objects on the bottom, including shellfish.

'Green Bumps' on Oysters

The 'green bumps' on oysters brought from Long Island and planted in Oyster River, Chatham, were the source of the Massachusetts invasion. The most recent reported infestation is Barnagat Bay, N.J. The State Conservation Department is trying to help shellfishermen salvage clams overgrown by Codium.

This subspecies of 'Codium frogile,' presumed native to Japan, spread throughout the Pacific and into the Atlantic. It was reported first in Europe around 1900. It thrives best in cold deep water and reproduces by fragmentation and zoospores (millions are released in February). ('Shellfish Soundings,' Feb. 26, 1969.)

Wisconsin U. Opens Eutrophication Center

An information center at the University of Wisconsin will provide researchers with many reference materials on eutrophication--"the aging process of surface waters enriched or fertilized by natural and waste-borne nutrients." This is reported by the Great Lakes Commission.

The Commission says the process is common to all water bodies. But man's activity has accelerated rates of aging--and upset

dramatically the balance of nature in more and more areas.

The eutrophication center will be associated closely with the research work of the University's Water Resources Center at Madison.

Demand for Fresh Fish Increases in Midwest

There is increasing demand for fresh fish in the midwest, report BCF personnel after interviewing distributors and retail buyers in several cities.

Several airlines, recognizing this demand, have maintained commodity rates for fishery products shipped to several points in the U.S. The airlines are looking into distribution problems faced by the fishing industry.

The Major Problem

The major need of distributors, retailers, and airlines is to locate a continuous supply of fresh products which would be shipped in suitable condition.

BCF sees a need for a uniform method of educating fresh-fish producers on the nature and potential of inter-regional markets.

Food Buyers from Abroad to Attend U.S. Conference

The U.S. Department of Agriculture and the Super Market Institute are sponsoring a conference for food buyers from abroad. It will be held in Atlantic City, N.J., May 11-14, 1969. By encouraging the world's top wholesale and retail food buyers to meet with their U.S. counterparts, the sponsors hope to build export markets for U.S. processed foods. U.S. Agricultural Attachés in leading dollar markets around the world have been promoting the conference. Many foreign importers have said they would attend.

A Switch for BCF

For BCF, which will participate, the conference turns around one of its important activities. For several years, BCF has been promoting exports of U.S. fishery products by taking part in foreign trade fair exhibits.

1969 'International Code of Signals' Is Available

The 1969 'International Code of Signals' is useful to all boat owners--of small craft using coastal waterways and of large offshore vessels. It answers questions about the meaning of flag hoists, how to signal for assistance, radio/telephone procedure, and ways to facilitate all types of necessary communication equipment of all seagoing vessels.

The book is available from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. Price: $4 a clothbound copy.

The Code of Signals was adopted in 1965 by the UN's Inter-Government Maritime Consultative Organization. It is also published by France, Italy, Germany, Japan, Spain, Norway, Soviet Union, and Greece. The Code is understood by all nations.

Revised Code Effective

The revised Code became effective April 1, 1969. It will be used by all ships of the U.S. Navy, Coast Guard, and Merchant Marine; Naval and Coast Guard radio and shore stations, private marine radio stations, and marine departments of steamship companies.

There are 446 signals for distress and emergency, 327 for casualties and damages; 328 for navigation and hydrography; 177 for maneuvers; 137 pertaining to cargo, crew, fishing, pilot, port and harbor; 169 for meteorology and weather; 13 for international sanitary regulations; and 503 for medical assistance and weather.

A Correction

The picture story on Menhaden, CFR Jan. 1969, p. 16, should have said that today nearly all menhaden are used to make high protein fish meal.

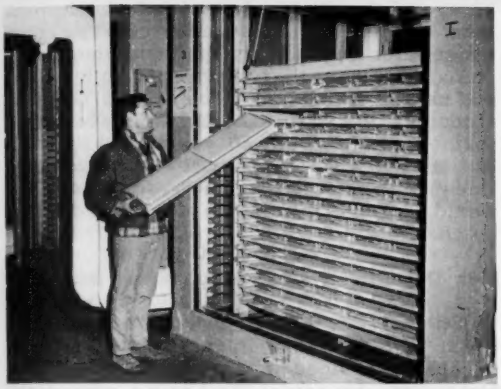
'SEAFREEZE ATLANTIC' Sails on First Fishing Trip

The largest fishing vessel to fly the U.S. flag--the 'SEAFREEZE ATLANTIC'--left its home port of New Bedford, Mass., March 28, 1969, on its first fishing trip. The $5 million, 297-foot, 3,120-ton freezer stern trawler will fish off Labrador "for anything that can be found in the water," a company spokesman said. He presumed the fish would be groundfish, codfish, and pollock.

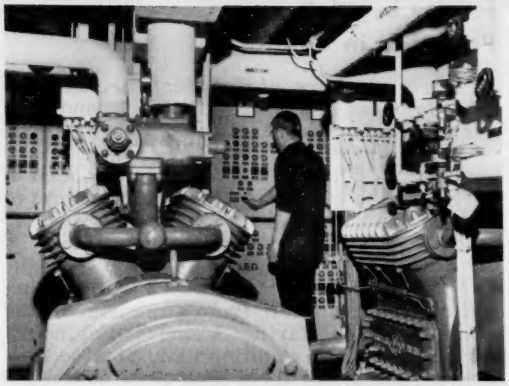
The vessel cruises at 14.4 knots and can cover 26,000 miles. She is carrying a crew of 54 in air-conditioned cabins: 10 fishermen, 28 processing personnel, 7 in engineroom, and 9 officers.

A sistership, the 'SEAFREEZE PACIFIC,' will fish off the Pacific Northwest from a West Coast port.

The trawlers can stay at sea 2 months and process their catch. They are equipped to use nearly everything they catch. Inedible or trash fish, and waste from the cleaning process, will be converted to fish meal and fish oils.

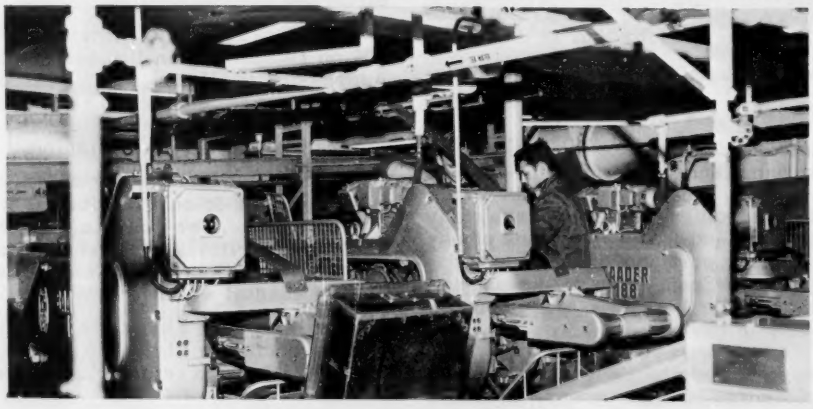


One of three tray freezing units.



Refrigeration plant.

Fish meal plant.



Filleting machines--fish processing factory.

(Photos: Robert K. Brigham)

Fishery Legislation Proposed in Congress

More members of Congress are showing their interest in greater utilization and conservation of ocean resources.

On Mar. 20, Sen. Magnuson introduced S. 1588, a bill to establish a National Institute of Marine Medicine and Pharmacology. Senators Fong and Pelly were cosponsors.

Speaking in support of the bill, Sen. Magnuson quoted a letter from a member of the Commission on Marine Sciences, Engineering, and Resources stating that "Marine bioactive substances as a source of new commercial pharmaceutical products constitute an almost completely unexplored area of research. At the present time there is not a single industrial organization or governmental agency that is making a continuous systematic exploration of new bioactive substances from marine creatures."

Quoting from a report of the National Conference on Drugs from the Sea, Aug. 1967, Sen. Magnuson added: "The Institute should be established for the purpose of conducting and supporting marine research. . .advancing scientific knowledge in marine biochemistry, pharmacology, toxicology, nutrition, microbiology. . .bionics and technology, as it may relate to the causes, diagnosis, prevention, treatment and control of physical and mental diseases, and other impairments of man."

Sen. Magnuson added that he is "convinced that a U.S. Institute of Marine Medicine and Pharmacology could make a contribution to world health unexcelled by that of any other nation."

Marine Sanctuaries

On Mar. 20, Sen. Brooke introduced for himself and Sen. Kennedy S. 1592, the Marine Sanctuaries Study Act of 1969. This would authorize the Secretary of the Interior to study the most feasible and desirable means of establishing certain portions of the tidelands, Outer Continental Shelf, seaward areas, and Great Lakes of the U.S. as marine sanctuaries.

Sen. Brooke cited the dangers of uncontrolled exploitation of these areas. He noted that "oil drilling operations which once destroyed fish with their seismic explosions have now been brought under control, but underwater gear and drilling equipment still remain to plague the fishermen with his lines and nets." He also deplored the fact that "landings of fish by U.S. fishermen have remained constant for 30 years, and that this Nation, with one of the most extended coastlines and richest marine resources in the world, accounts for only 4% of the world's fish catch."

New Department of Oceanographic Services

On Mar. 25, Rep. Pepper introduced H.R. 9482, to establish a Department of Oceanographic Services within the cabinet of the President. He said: "To those who might question the advisability of yet another 'bureaucratic department'. . . . Under the present Federal setup relating to maritime and marine interests, there is a total of 11 separate agencies engaged in the marine sciences. This legislation envisions the coordination and consolidation of the major civilian marine functions of the Federal government to accomplish. . .the expansion of exploration of marine environs and the use of marine resources, and development of port and harbor and estuarine areas. . . ."

The new department would have four Assistant Secretaries, one for Marine Fisheries.

Territorial Seas

On Mar. 26, Reps. King, Whalley, and Riegle introduced H.J. Res. Nos. 602, 604, and 606, respectively. These were joint resolutions to declare U.S. policy with respect to its territorial sea.

Rep. Edwards, Ala., introduced H.J. Res. 605 on reciprocity in U.S. territorial waters. Addressing the House, Mr. Edwards said this resolution was designed to stiffen U.S. policy in establishing and enforcing our territorial waters claims and ocean fishing limits.

He proposed that "we should adopt a policy of reciprocity in our territorial waters and fishing limits. . .we would impose on any ship the same territorial and fishing limits which that ship's national government imposes in its own coastal waters."

The resolution also calls for a new international conference to reach agreement by all coastal nations on territorial limits.

--Barbara Lundy

OCEANOGRAPHY

Vast Study of Atlantic East of Barbados Starts in May

The U.S. is cooperating with Barbados in setting up an extensive study of the links between sea and air. The planners say "the mechanism of sea-air interaction is almost unknown, yet it is the primary process which drives the atmosphere's circulation and its weather systems. Unless this process is explored and understood it will be impossible to extend weather prediction to more than a few days."

The project is called BOMEX--Barbados Oceanographic and Meteorological Experiment. It is "the most intensive scientific investigation ever made over a large ocean area."

Area Involved

In May, June, and July 1969, 24 planes, 10 ships, several satellites, 12 buoys--and a vessel that "flips" from horizontal to vertical position--will gather data from the atmosphere and ocean covering 90,000 square miles of the Atlantic east of Barbados; the area stretches vertically from an altitude of 100,000 feet to the sea floor at 18,000 feet. About 1,500 people will take part in data gathering.

BOMEX is the first in a series of large-scale research projects planned by many nations under the Global Atmospheric Research Program (GARP) and directed toward development of a World Weather Watch.

Combined Operation

BOMEX combines the efforts of oceanographic and meteorological communities with 7 Federal departments and independent agencies, 19 universities, and 7 industrial laboratories in the U.S., Canada, and Barbados. For the U.S. Government: Department of Commerce (ESSA); Department of Defense; Interior Department's BCF; Department of Transportation (U.S. Coast Guard); Atomic Energy Commission; NASA; and the National Science Foundation.

BOMEX Objectives

Dr. Joachim P. Kuettner, BOMEX Director, explained the objectives of the BOMEX experiment. He described the air-sea interface as "the scene of a complex and continuous exchange of energy, water, gases, and particulates."

Dr. Kuettner said: "Most of the heat received from the sun is stored in the tropical oceans between the latitudes of 30 degrees North and 30 degrees South, a region representing half the earth's surface.

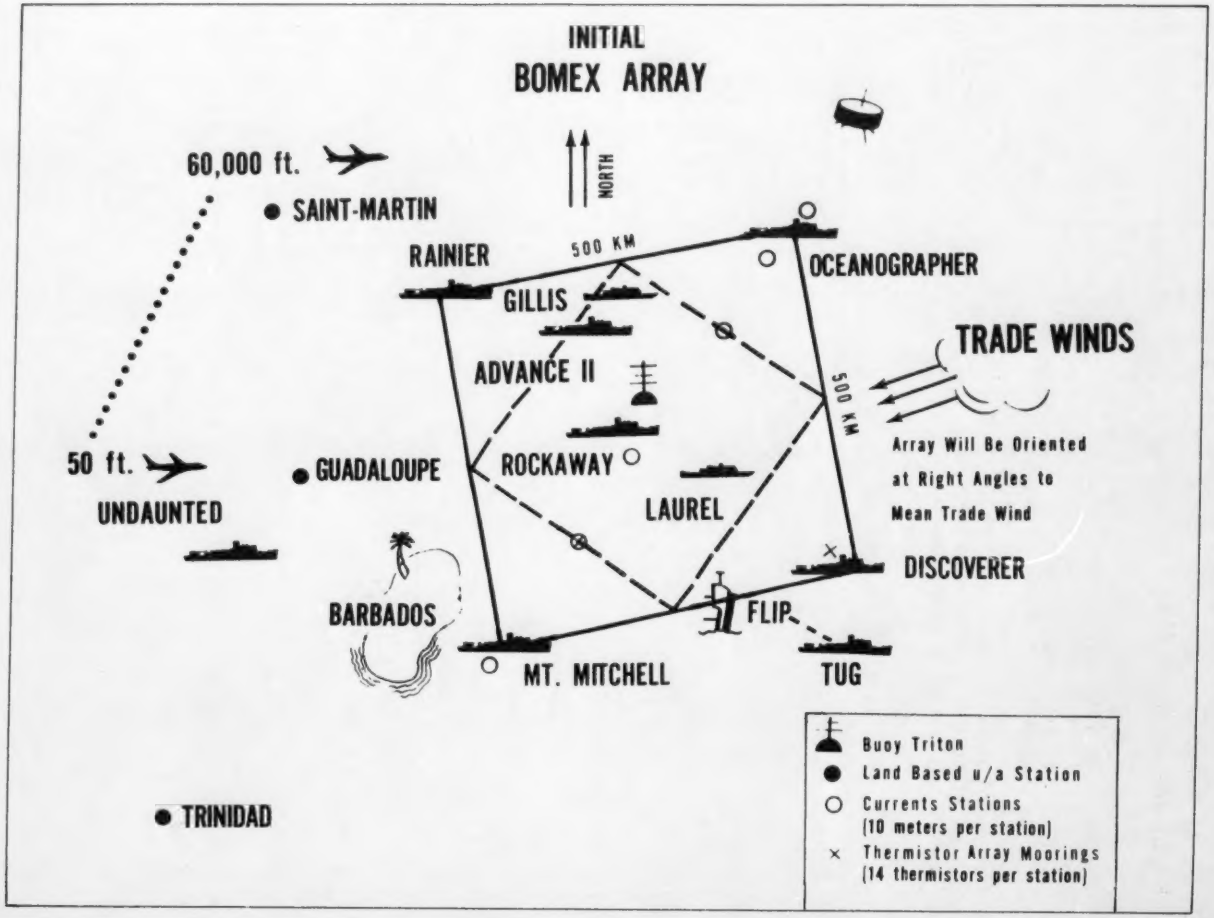
"In contrast, the earth loses heat by radiation almost uniformly at all latitudes, so heat has to be transported from equatorial regions to higher latitudes. Strangely enough, this transport is not done by the ocean, but primarily by the atmosphere. This process, of which relatively little is known, seems to occur in three stages. First, the energy in the ocean transfers to the atmosphere in a turbulent boundary layer about 6,000 feet thick. Most of this energy moves from ocean to air as latent heat in the form of water vapor. Next, the energy finds its way from the boundary layer to the upper layers of the troposphere. Finally, it is transported to higher latitudes by fast-moving air currents, sometimes in the nature of jet streams."

BOMEX will explore the first 2 steps in this process. It will examine in detail "the exchange of energy between ocean and atmosphere, and the vertical and horizontal spreading of these energies within each fluid."

An attempt will be made to predict the area-wide sea-air interactions in a mathematical model based on conventional and satellite observations.

Air Armada in Action

During July, a major study will be conducted by many aircraft to explore tropical weather disturbances. The objective will be to gain information needed to improve mathematical models of the global atmosphere. These flights will be based on continuous photos received at Barbados from NASA's ATS-III (Applications Technology Satellite). The satellite will be moved to a stationary position above Barbados.


INITIAL
BOMEX ARRAY
NORTH
60,000 ft.
SAINT-MARTIN
RAINIER
500 KM
OCEANOGRAPHER
GILLIS
TRADE WINDS
ADVANCE II
500 KM
Array Will Be Oriented
at Right Angles to
Mean Trade Wind
50 ft.
GUADALOUPE
ROCKAWAY
UNDAUNTED
LAUREL
DISCOVERER
BARBADOS
FLIP
MT. MITCHELL
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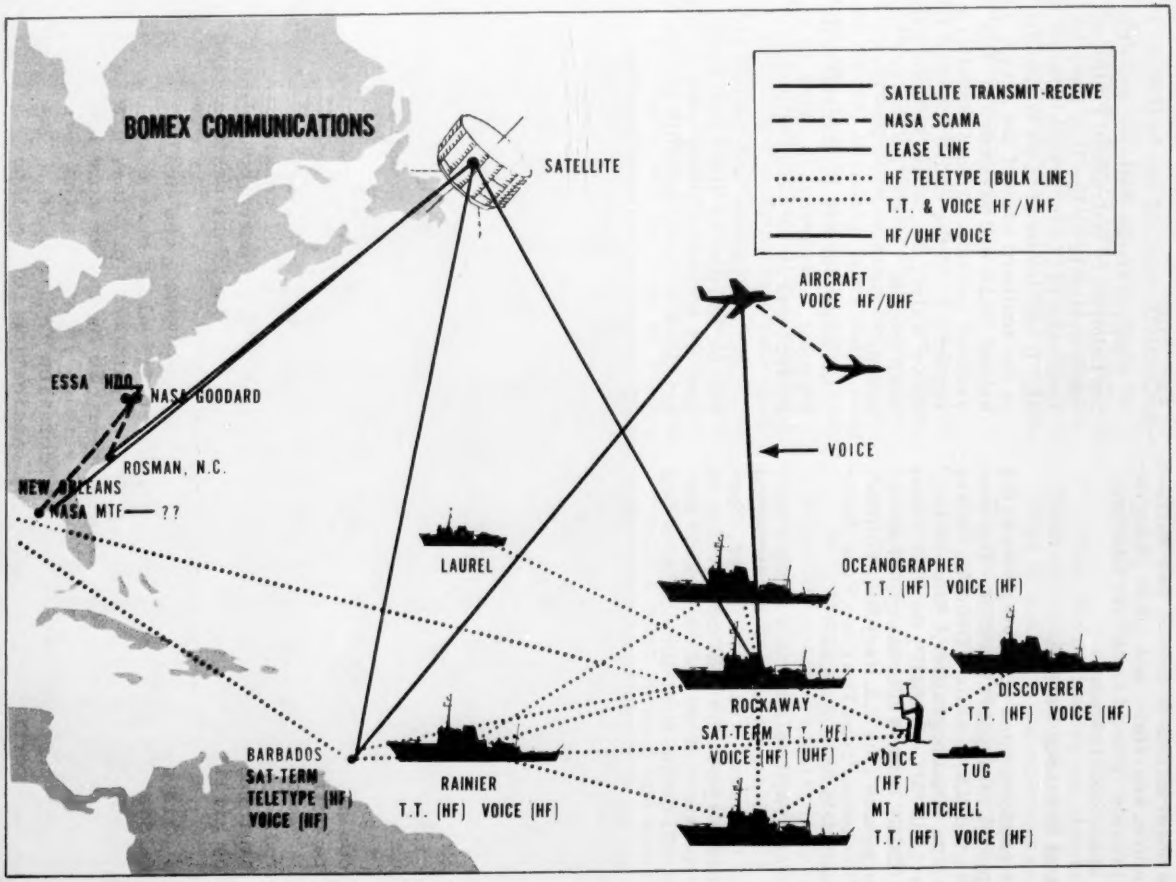
BOMEX COMMUNICATIONS
SATELLITE
SATELLITE TRANSMIT-RECEIVE
NASA SCAMA
LEASE LINE
HF TELETYPE (BULK LINE)
T.T. & VOICE HF/VHF
HF/UHF VOICE
AIRCRAFT
VOICE HF/UHF
ESSA HDQ
NASA GODDARD
ROSMAN, N.C.
NEW ORLEANS
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DISCOVERER
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TELETYPE (HF)
VOICE (HF)
RAINIER
T.T. (HF) VOICE (HF)
MT. MITCHELL
T.T. (HF) VOICE (HF)

Data from 5 ESSA satellites and 2 Nimbus satellites will be used to provide photos of the cloud cover. Several aircraft will obtain detailed observations of clouds, sea-surface temperature, sea state, and other observations to provide "ground truth" for interpreting the space observations.

Armada of Research Vessels

Many platforms and observing systems are required to support BOMEX. The vessels are: the U.S. Coast and Geodetic Survey (CGS) ships 'Oceanographer,' 'Discoverer,' 'Rainier,' and 'Mt. Mitchell'; the U.S. Coast Guard (USCG) cutters 'Rockaway,' 'Laurel,' and 'Courageous'; the U.S. Navy Ship 'Gilliss'; BCF's 'Undaunted'; and The Cape Fear Technical Institute's SS 'AdvanceII'.

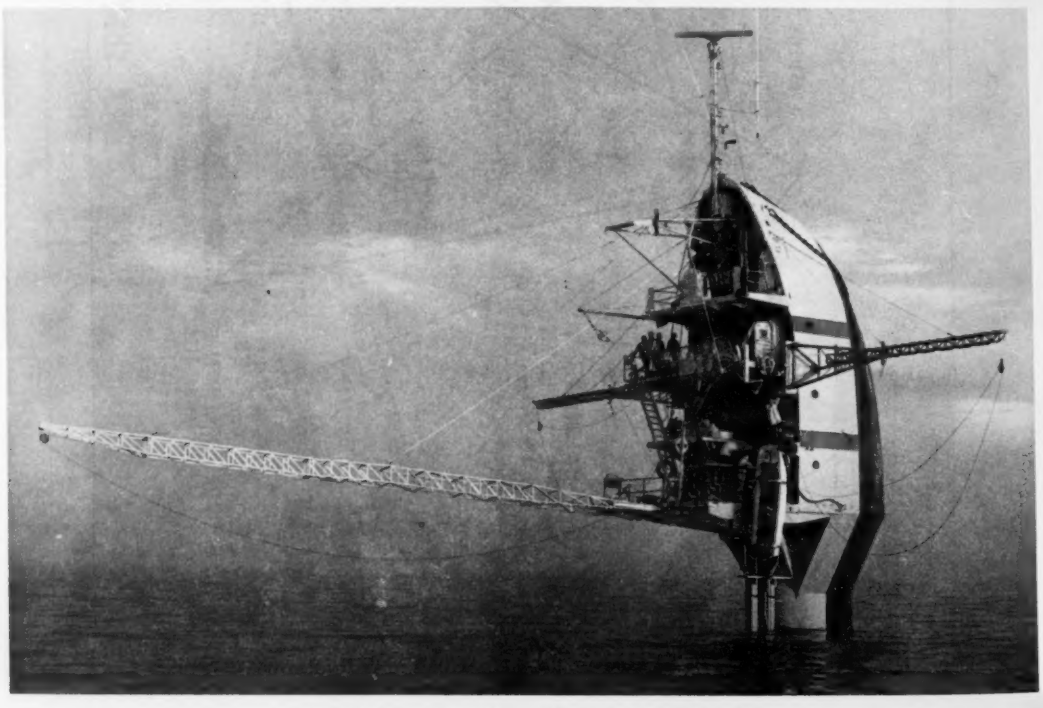
CGS ships will be stationed at the 4 corners of the 5-degree-square experimental area; the Rockaway will be in center. Special mooring systems will be installed on these 5 vessels to anchor them at their stations. It will be the first time ships of this size will be anchored in 18,000 feet for such long periods.

The 'FLIP'

A unique stable platform, the FLIP (Floating Laboratory Instrument Platform), is being made available by the U.S. Navy and Scripps Institution of Oceanography between May 2 and 29. It will be towed in its horizontal position to the southern edge of the array. There, its ballast tanks will be flooded to "flip" it to the vertical position. When the platform is fully vertical, 55 of the entire 355-foot length are above water; the other 300 feet extend well down into the "silent, motionless part of the ocean."

A large variety of aircraft will provide frequent measurements close to the ocean surface and at very high altitudes.

Communications and Search and Rescue will be handled by the Coast Guard. It will conduct communications experiments using satellites to test feasibility of using satellite



'FLIP' in flipped position. (Official U.S. Navy Photo)

communications for future activities similar to BOMEX.

The Aerospace Rescue and Recovery Service (ARRS) of the Military Airlift Command, USAF, will pick up data from the 5 moored ships to ensure very rapid feedback of samples to the scientists at Barbados. ARRS will also provide emergency resupply and recovery support for all BOMEX vessels.

Sophisticated Equipment

Between March 3 and April 23, special equipment was installed at Gulfport, Miss., aboard the 5 fixed vessels: Signal conditioning and recording devices, sensors, meteorological booms, boundary layer instrument packages, and the free-fall mooring systems.

NASA is "designing, installing, maintaining, and operating a computerized data-management system for the project." Five Signal Conditioning and Recording Device (SCARD) units are being installed on the 5 fixed vessels to record data from atmosphere and ocean. The tapes will be flown to NASA's Mississippi Test Facility to be processed and reduced. This will provide a "quick look" to the BOMEX Director to establish data validity and enable him to modify the observation program if necessary. The data will become part of BOMEX's master data file.

ESSA is the lead U.S. agency for the experiment. It is the U.S. Cooperating Agency with Barbados. The Barbados Cooperating Agency is the Ministry of Home Affairs.

Bathymetric Charts Guide Mariners

Bathymetric charts showing the sea floor's diversified topography are among the most valuable navigational guides available to Navy and civilian mariners, believes the U.S. Naval Oceanographic Office (NOO). The charts also may lead toward more effective use of the sea. The NOO-produced charts result from scientific interpretation of sounding data collected by military and merchant ships.

After evaluating these data for accuracy, the charting specialists plot the 'best' information. From it, they draw depth contours to show submarine mountains, ridges, canyons, valleys, and trenches. (See charts and sketch.) Then, navigators using advanced echo-sounding equipment can use the charts to guide their ships "from seamount to escarpment to ridge in the open ocean."

Chart's Uses

Also, the navigators can determine positions and obtain running fixes by locating their ships in relation to the underwater topographical features shown on bathymetric charts. The charts also aid geophysicists, geologists, and oceanographers studying the oceans. Charts can assist military and civilian planners to prepare for routing submarine cables and selecting sites to install equipment and facilities.

NOO states that each bathymetric chart comprises an area "equal to Utah and Nevada combined, with a topography that may be equally as diversified."

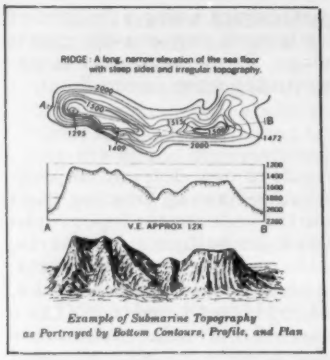
Water conceals the ocean floor, so contours developed from soundings of submarine geographical features for such a large area "represent a most difficult and exacting task." The operation is like charting the mountains and valleys of Utah and Nevada from contours based on elevation readings taken 5 to 10 miles apart with a spacing of 2 to 50 miles.

Charting Ocean Topography

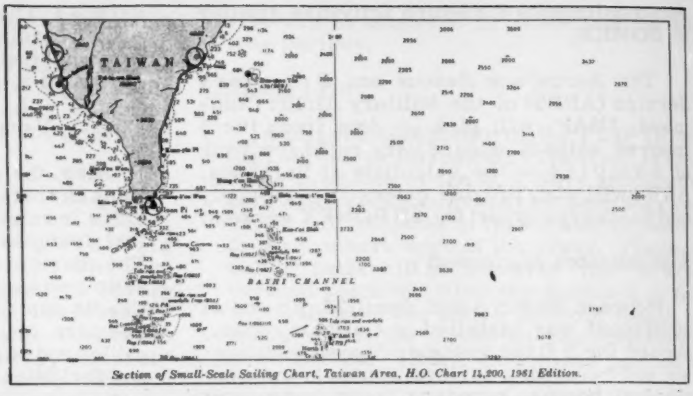
Soundings--measurements of water depth beneath the ship--are taken at intervals by depth recorders. The soundings give an idea of deep and shallow points. Specialists review these points carefully to determine submarine mountain ranges, ridges, valleys, etc.

However, even the slightest difference in positions of 2 independent observers working from unstable platforms at different times could result in error. "One (observer) could actually be looking at the elevation of a peak, while the other was inspecting the elevation in a valley or basin."

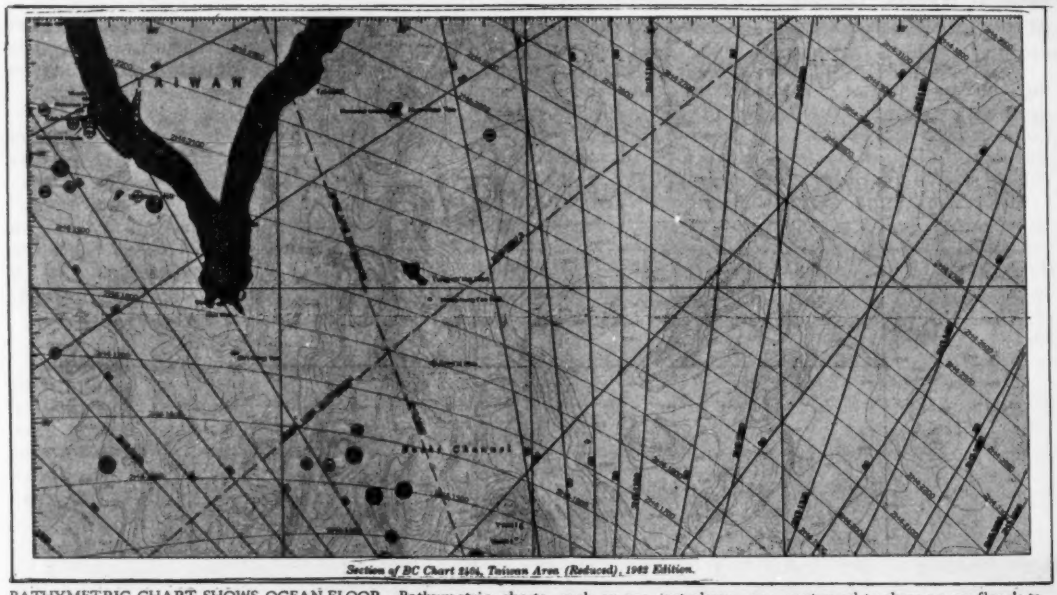
NOO points out that although absolute accuracy "can never be achieved by this means, the trained geologist or bathymetrist can interpret the combined observed data, including that collected on planned hydrographic surveys and that obtained along 'random tracks'--the courses taken by civilian and military ships on merchant routes or on operations--and come up with a reasonable portrayal of the true land forms."



Example of Submarine Topography as Portrayed by Bottom Contours, Profile, and Plan



Section of Small-Scale Sailing Chart, Taiwan Area, H.O. Chart 14,200, 1961 Edition.



Section of BC Chart 3704, Taiwan Area (Reduced), 1962 Edition.

BATHYMETRIC CHART SHOWS OCEAN FLOOR--Bathymetric charts, such as one just above, are contoured to show ocean floor's topography. The contours result from interpretation of countless soundings and can produce drawing of a submarine mountain (upper left). A standard sailing chart (upper right) shows noninterpreted soundings. Charts, with their contours, give mariner 100% information on sea floor, while standard sailing chart, showing only selected soundings, gives about 2% data.

Evaluating Method

The charting specialists must evaluate the method in obtaining data. They must know type of echo sounder, kind of navigational control used, how tracks were adjusted to navigational position fixes, and frequency of fixes.

Sounding Data Sometimes Distorted

Sounding data can be distorted by 'phasing,' the Deep Scattering Layer (DSL), and interference.

Phasing, NOO explains, "is a recording phenomenon that occurs when the distance from the keel of the ship to the bottom is greater than the scale of the depth recorder used." This occurs when the operator of sounding equipment uses a shallow-scale recorder, such as one with a 600-fathom maximum, in deeper waters.

The DSL, a marine life phenomenon, also can cause operators of depth sounders to report shallow areas where, in fact, the ocean

floor is much deeper. The Layer is composed of fish and other small marine organisms. They shun light and rise to surface to feed at night and on dark, cloudy days. They sink into sea's depths at sunrise on bright days. Today's deep-sea sounders can, with good acoustic conditions, observe both DSL and true sea floor. But use of shallow-water echo sounders can result in misinterpretation of the DSL as true sea floor.

Interference results from the transmission of 2 or more sound waves on the same or different ships in the vicinity. When 2 echo sounders run simultaneously, the transmitted pulse "is generally so strong that it is recorded on the other echo sounder, even if the frequencies are different." The result is that the pulse can be interpreted as a measurement, when actually it is a direct wave from the other sounder.

Doubtful Features Charted

Despite meticulous interpretation, the specialists know that all their depth measurements are not accurate. So they will chart a 'doubtful' topographical feature in the interest of safe navigation and not remove it until its existence can be disproved.

This can be done because the bathymetric chart--a contoured map, not one showing thousands of numbers to indicate depths--allows specialists to use all sounding data instead of the 2% shown on standard sailing charts.

NOO concludes: "Continued emphasis on oceanographic programs, including modest but precise survey efforts to fill voids and resolve discrepancies in existing bathymetric data holdings, will not only result in better charts for the navigator but probably is the essential first step toward reaching the goal of 'a more effective use of the sea.'"

Camera Mounted on Diving Vehicle Saves Oceanographers Time

An underwater camera mounted on a Pegasus diving vehicle speeds bottom surveying so much that oceanographers of the U.S. Naval Oceanographic Office (NOO) believe the technique will greatly extend the capabilities of divers.

Chet Bright, who heads the NOO diver-oceanographer group, recently completed a bottom study in the south part of Biscayne Bay, Florida. He reported that divers using a motion-picture camera aboard Pegasus spent about 3 hours in diving time to obtain continuous bottom photographs of a 30-foot by 10-mile track. Bright said: "This is indeed speedy surveying when you consider the tremendous amount of bottom covered. A diver, using conventional swimming techniques, would have to spend weeks covering the same area."

Project SPOC

NOO scientists are working on Project SPOC, a cooperative spacecraft oceanography venture with the University of Miami as part of NASA's Earth Resources Program. They are comparing the photos taken by the divers with those snapped from a NASA aircraft.

The scientists are using the divers' photos as an accuracy base to demonstrate feasibility of observing marine life and charting underwater features in coastal waters through aerial and, eventually, satellite photography.

Biscayne Bay Survey

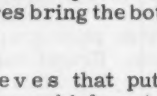
During the Biscayne Bay survey, one diver-oceanographer in the 3-man team not only operated the camera down to about 3 feet off bottom--but also controlled vehicle along survey track. (See photograph.)

(Photo: James B. Sweeney)

"The controls for the Pegasus are much like those in an airplane," Bright explained. The vehicle, equipped with all instruments necessary to maintain course, also carried floodlights to light area being photographed, and depth sounders to tell diver how far he was from bottom.

The underwater 16 mm. camera is capable of snapping 500 frames per second. To insure accuracy, the oceanographers slowed it to 16 frames per second. The camera is encased in fiberglass and can operate at depths of 300 feet. "Its pictures bring the bottom up to us," Bright stated.

Bright believes that putting a camera aboard a Pegasus vehicle not only will speed bottom surveying, but it also will be useful in "any type of fine grain operation," including checks on underwater cables and geological and biological studies.



Nation's First Estuarine Prediction Service in Maine to be Evaluated

The Nation's first estuarine prediction service, in Maine's Penobscot River and Bay estuary, will be evaluated beginning in April by ESSA's Coast and Geodetic Survey (CGS) to determine its effectiveness.

The service was launched in May 1968 as a one-year pilot program. The Government hopes it will develop into an important service for Government and private agencies in pollution control.

The evaluation will include a circulatory study of the entire Penobscot River and Bay Estuary by the 'Ferrel.' The 133-foot, 289-ton ship is the first to be built in the U.S. specifically to determine circulatory patterns of tidal currents. The study will continue into October 1969. It will also provide more accurate navigational services to yachting, fishing and commercial interests. It will be the first extensive one ever made of the tidal currents in this area.

The survey will help determine how accurate predictions have been in the past year, and provide more data to improve service.

The Prediction Service

Under the estuarine prediction service, advance forecasts are issued twice monthly on the rate possible pollutants pass through the estuary. The forecasts are made by CGS and the Weather Bureau, which furnishes the necessary river discharge forecast and advisory information.

C. R. Muirhead of CGS said the service can be of 'tremendous importance potentially' to commercial and sport fisheries, wildlife conservation and, during the summer months, to recreational activities, especially swimming and boating. "If fully utilized," he added, "this service could enable state and local authorities to institute possible remedial measures to reduce the rate at which potential pollutants are being added to the water."

Survey N. Carolina Seabed

The first detailed large-scale survey of the seabed off the Atlantic Coast between Hatteras and Cape Fear, North Carolina (N.C.), is underway, reports the Coast and Geodetic Survey (CGS).

The 5,000-square-mile survey is being conducted by the 'Peirce,' based at Morehead City, N.C., until May 1969. It will be continued by the 'Mt. Mitchell' from August to October. The survey data will be used for a new bathymetric map of the continental shelf from Wilmington, N.C., to Hatteras, N.C., to be issued within the next 2 years.

Part of Program

The bathymetric survey is part of a long-range program begun off the Atlantic Coast in 1967. The program's purpose is to provide detailed maps of the entire continental shelf, which extends from the shore to a depth of about 600 feet. These maps delineate the sea-floor contours and aid Federal, State, and industrial interests in exploring and developing its vast potential resources.

The Peirce will survey the sea bottom from Cape Lookout to Cape Fear, to the edge of the shelf, while the Mt. Mitchell will work the Cape Lookout-to-Hatteras area.

The Operation

The last bathymetric surveys in this area were made over 40 years ago. These provide general information of the sea bottom for vessels approaching the more shallow areas close to shore. During the current survey, the ships will survey the seabed in detail from 60 feet to the shelf edge. They will determine, for the first time, the detailed configuration of underwater valleys, plains, and

ridges. Existing CGS survey information of shallow waters also will be used for the map. The new data will be incorporated in existing nautical charts of the deep waters.

The hydrographers will use an echo sounder to measure and record depths. These will be determined by the time required for a sound wave produced in the vessel's hull to reach bottom and for its echo to return. The return echo is recorded on a permanent graph at rapid intervals. These form a continuous profile of the sea floor below the moving vessel. The ship's position during surveying will be obtained by an electronic positioning system.

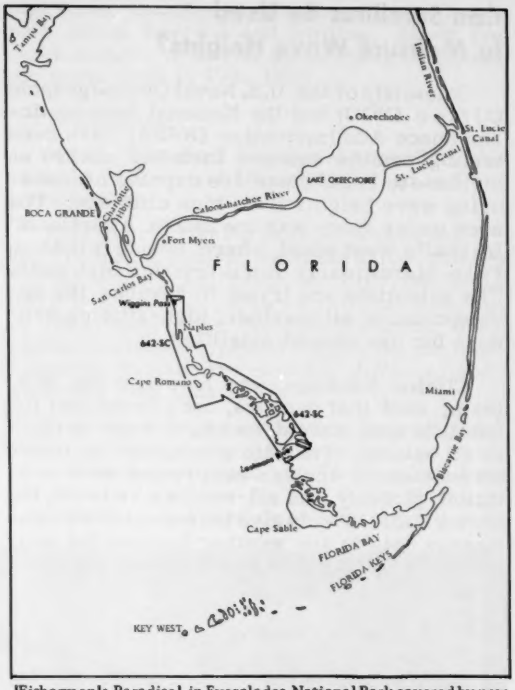
Chart 'Fishermen's Paradise' in Everglades National Park

The Coast and Geodetic Survey has published a new nautical chart that covers in detail a "fisherman's paradise" in a key part of the Everglades National Park.

The area is a favorite for fishermen from south Florida and from hundreds of miles around. Before, fishermen faced the danger of getting lost within minutes in the maze of twisting waterways that cover the subtropical area. The new large-scale chart (1:40,000) will provide the extra detail required to navigate safely.

Area Covered

The accordion-folded, small-craft chart (642-SC) can be readily unfolded in the cockpits of recreational boats. It covers the park's northwest section along the southwest coast of Florida, from Lostmans River to Wiggins Pass, and thousands of mangrove islands offshore. Lostmans River is about 70 miles northeast of Key West, and Wiggins Pass is about 25 miles south of Fort Myers.



'Fishermen's Paradise' in Everglades National Park covered by new nautical chart issued by the Coast and Geodetic Survey.

Color and infrared photography was used to depict the many islands, lakes, and natural channels in this relatively uncharted wilderness area.

The new chart is expected to increase the park's recreational value. Each year nearly 850,000 people visit it. The park contains about 365,700 acres of water surface and over 1,000 miles of rivers and streams.

The chart may be purchased for $1.50 from Coast and Geodetic Survey nautical chart agents, or from Coast and Geodetic Survey (C44), Rockville, Md. 20852.

Can Satellites Be Used to Measure Wave Heights?

Scientists of the U.S. Naval Oceanographic Office (NOO) and the National Aeronautics and Space Administration (NASA) have been testing remote sensors installed aboard an airplane to see if these are capable of measuring wave heights from high altitudes. The area under study was the North Atlantic off Ireland's west coast, where strong winds in late March-early April produce high seas. The scientists are trying to advance the development of all-weather, high-altitude sensors for use aboard satellites.

Clinton Beckner, who headed the NOO team, said that sensors, once developed for satellite use, should measure wave heights in all oceans. The data are needed by ocean forecasters to analyze and predict wave conditions globally. As all-weather sensors, the devices also should give the forecasters continuous data in any weather because the sensors are being designed to penetrate cloud cover.

Value of Remote Sensing

Beckner explained: "Such remote sensing capabilities would make for inexpensive forecasting because the cost of orbiting a satellite is less than that of deploying and maintaining several aircraft that would be needed to provide similar, world-wide coverage." He added that inexpensive and rapid forecasting of wave conditions would have a "tremendous impact" on naval, shipping and fishing operations, and scientific activities. "The Navy, like everyone who uses the seas, could operate in the oceans more effectively if Navy men have a better idea of what wave conditions are going to be in any area of operations." Scientists could learn more about wave growth and decay by studying the wave height data provided on a world basis by satellite sensors.

What Scientists Seek

The scientists are interested primarily in determining if they can record wave heights in heavy seas (more than 18 feet). They learned earlier, in March 1966 near Bermuda, and in April 1968 off Ireland's east coast that the high-altitude sensors can measure wave heights in moderate and low seas.

They installed the sensors--a microwave radiometer and a radar scattometer--in a NASA test airplane. A second plane, a Super Constellation assigned to NOO, was equipped with laser and radar wave profilers. These instruments give reasonably accurate readings from altitudes of 500 to 1,000 feet, but they are not designed to record wave heights from high altitudes.

Both planes took off from Shannon, Ireland, when observers aboard 3 European weather ships stationed 400 miles apart off Ireland reported heavy seas. The NASA plane flew at 20,000 to 50,000 feet, and the NOO plane at 500 to 1,000 feet. On each run, the planes logged 1,200 miles--400 miles from Shannon to the first weather ship, 400 miles to the second, and 400 miles back to Shannon. There, the scientists compared remote sensors' readings with those recorded aboard the NOO plane--and with on-the-spot measuring devices aboard the 3 weather ships.

What's Ahead

Beckner concluded: "If at the end of the five scheduled runs we find that the readings from the remote sensors compare favorably with those taken both by the instruments aboard the low-level Oceanographic Office plane and by the ships' devices, we will know that the sensors, too, can measure wave conditions in heavy seas from altitudes of 20,000 to 50,000 feet.

"Then at a later date, we will try the sensors aboard high-flying aircraft at even higher altitudes and will again fly them over low moderate and heavy seas. If they record wave heights in the three types of seas at these still higher altitudes, we will be ready to test them on a satellite."

Foreign Fishing Off U.S. in February 1969

NORTHWEST ATLANTIC

Bad weather and severe snowstorms hampered surveillance in February. However, 182 individual fishing and support vessels from the USSR, Poland, and Japan were sighted, considerably more than the 70 seen in January.

Soviet vessels increased from about 50 early in the month to about 150 by the end. In Feb. 1968, only 53 Soviet vessels were sighted between Nantucket and the Virginia Capes. Twenty-one Polish and 2 Japanese vessels were seen in Feb. 1969.

Off Southern New England

About 15 Soviet factory stern trawlers were sighted south of Nantucket to south of Block Island, R.I., in ICNAF Sub-area 5, just beyond the eastern boundary of the 'no fishing' zone. Catches were primarily red hake, with some herring and whiting. About the same number of Soviet stern trawlers fished the same area in Feb. 1968.

Off Midatlantic

Soviet: The fleet increased from 25 to 50 vessels in Jan., and 60 more arrived in first week of Feb.

This year's fishing pattern is quite different from last year's, when the large buildup did not begin until March. In 1968, the fleets were mainly large factory stern trawlers, but in 1969 most were medium trawlers. This change in vessel-type and fishing season indicates the Soviets are seeking different species this year than in 1968.

In early Feb., 50 medium trawlers and 3 'Slava' class processing motherships were spread in an irregular line 70-80 miles long off southern New Jersey, from Barnagat Lightship to south of Cape May. Equipment

Fig. 1 - Empty barrels (on platform above stern) will be used to store salted herring in the refrigerated holds of the base ship 'Trudovaya Slava,' built in West Germany in 1967. (U.S. Coast Guard)

on all vessels was lashed down, decks were awash, and the fleet seemed to be weathering out a storm rather than fishing. No catches were observed.

Moving south toward the Virginia Capes, this fleet was joined by enough other vessels to double its size. By the second week in Feb., 112 fishing and support vessels had been sighted.

off Currituck, N.C. By Feb. 25, the fleet off New Jersey had joined the Currituck fleet off Cape Hatteras, where Soviet exploratory vessels had discovered large herring schools.

Polish: In early Feb., about 12 vessels supported by a mothership, the 'Pomorze,' fished in the Mid-Atlantic Bight. Although operating independently, Polish fishermen kept close to the Soviet fleet, which supplies

Fig. 2 - With a side-trawler nestled alongside, the Polish base ship Pomorze supports the fleet fishing herring off the coast of Virginia. The photo was taken from a U.S. Coast Guard surveillance plane on February 8, 1969. (U.S. Coast Guard)

Eighty-nine were seen about 50 miles east of Norfolk, Va., in a 35-mile-long area from Cape Charles to south of Cape Henry. Another 7 trawlers fished herring about 40 miles east of Chincoteague Island, Va. Moderate catches were seen on decks. Eleven other trawlers fished herring east of Cape May, N.J. A few vessels scattered between these groups were probably in transit or searching for fish schools. The groups, mostly medium trawlers, were supported by 5 modern processing motherships. Two stern factory trawlers sighted off Norfolk might have been doing exploratory fishing. Moderate-to-excellent hauls of sea herring were observed.

After midmonth, 69 Soviet vessels, including 10 support vessels, were sighted off Fire Inlet, N.Y., and as far south as Atlantic City, N.J. Most were fishing in 15-20 fathoms, 20-30 miles offshore. Moderate catches appeared to be herring; 1 stern trawler fished red hake. About 35 vessels fished

them with fishery intelligence--location of fish schools, information on fishing grounds, weather reports--and sometimes supplies, water, and fuel.

Early in the month, 3 trawlers were sighted huddled together riding out a storm about 40 miles off Cape May. On Feb. 13, 12 trawlers, with 7 Soviet trawlers, fished 40 miles east of Chincoteague. By the 20th, 13 Polish trawlers were scattered among a large group of about 70 Soviet vessels, from south of Long Island to east of Atlantic City. All Polish vessels were side trawlers, except for 1 stern trawler. Catches on side trawlers were herring; no catches were seen on the stern trawler.

Japanese: Two stern trawlers were sighted. On Feb. 4, 1 was sighted 65 miles southeast of Cape May, and on Feb. 20, 2 were seen in the Hudson Canyon area. Each time they were in the U.S.-USSR 'no fishing'

zone. No catches were noted. Representations have been made to the Japanese Government concerning abstention of fishing in this zone. The Japanese press reports that about 9 vessels will continue 'exploratory' fishing in the area during 1969.

U.S.-USSR Midatlantic Agreement

No Soviet vessels were observed in the 'no fishing' zone. Only 2 were seen in the Long Island loading and unloading zone.

Violations of U.S. Fishing Limits

On Feb. 8, 20 foreign fishing vessels were sighted inside the 9-mile contiguous zone. Eleven Polish and 4 Soviet vessels had fishing gear in the water. By the time a Coast Guard patrol arrived, all the vessels had moved beyond the 12-mile limit. The Polish fleet commander aboard Pomorze was warned that a repetition of the offense would result in seizure of the violating vessels. A few days later, most of the Soviet fleet had moved 40-50 miles offshore.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels were reported.

OFF CALIFORNIA

No foreign vessels were observed fishing in Feb. The last report of foreign fishing here was in Nov. 1968.

OFF PACIFIC NORTHWEST

Japanese: One longliner was sighted; no catches were observed. In Feb. 1968, 7 vessels, including 2 long-liners, were seen in the area.

Soviet: The first fishing vessel sighted in 1969 was a side trawler off Cape Flattery, Wash., in the second week of Feb. Fishing off Oregon in the third week, it was joined by another side trawler, and by a stern trawler in the fourth. In Feb. 1968, 13 vessels were sighted.

OFF ALASKA

Soviet: Vessels increased from 130 in late Jan. to 160 in Feb. The growth was in the flounder and groundfish fleets in the eastern Bering Sea. About 100 vessels were sighted in Feb. 1968.

The eastern Bering Sea flounder fishery followed the pattern of previous years, when vessels increased from 50 to 70 during Feb. At month's end, there were 25 factory trawlers, 30 medium trawlers, 13 factory vessels and refrigerated transports, and 2 support vessels.

The herring fleet--about 25 factory trawlers, 30 medium trawlers, 12 factory and refrigerated transport vessels and 3 support vessels--remained northwest of the Pribilofs in central Bering Sea throughout Feb.

Fig. 3 - The 571-foot long Soviet base or factory ship 'Spassk' nested with a tanker (visible in picture) and a refrigerated transport, a stern trawler, and a tug (only masts shown in picture) in ice pack in central Bering Sea. These ships are part of the approximately 70-vessel winter herring expedition off Alaska. (J. Branson)

Twelve medium trawlers fishing groundfish--primarily arrowtooth flounder and sablefish--off the Continental Shelf edge, north of the Aleutians in the eastern Bering Sea, were joined by 6 more medium trawlers. The latter fished in shallower waters, primarily catching Alaska pollock. Two refrigerated processing transports supported them.

Japanese: The fleet, about 40 vessels in late Jan., decreased to about 30 by end of Feb. This was about 25 fewer than in Feb. 1968.

Four stern trawlers fished ocean perch in the Gulf of Alaska during first half of the month; only 2 remained at the end. Four stern trawlers fished ocean perch along the Continental Shelf in eastern Bering Sea through the month.

Six trawlers, one factoryship, and 1 reefer fished flatfish and Alaska pollock in eastern Bering Sea. At least 2 factoryships en route from Japan were expected to increase effort in this fishery in early March.

The herring fishery northwest of the Pribilofs (close to the Soviet herring fishery) continued through the month, with 10 stern trawlers, 2 medium trawlers, and one factory ship.

Six to 8 longliners fished sablefish in the Gulf of Alaska during first 3 weeks. Effort began to decline during the last week and, by month's end, only 1 or 2 vessels remained.

IMPROVING UNDERWATER EXPLOSIONS

The vibrations produced by controlled underwater explosions are useful in such diverse tasks as prospecting for oil and developing new underwater communications systems.

Just dropping a few bombs over the side, however, won't do the trick, especially for the prospectors, who need extremely precise shock waves to examine soil and rock strata beneath the water. The trouble is that a charge set off at great depth or near the bottom creates a large bubble at the moment of explosion. This bubble pulsates as it rises to the surface, with an action similar to that of a taut spring which is suddenly released. The pulsations in turn cause secondary disturbances which interfere with the recording of the main shock wave.

One way around this is to put the explosive charge in a perforated sphere, which causes the bubble to break up into smaller bubbles that do not disturb the seismic recordings. This, however, poses the problem of reloading the sphere somehow when a series of successive explosions are necessary, as is often the case. Recently, two approaches to the problem have been patented--one from France and the other from the U. S.

The French method is simply to trail the perforated sphere from the end of a long tube leading to the deck of a ship. The explosive charges are dropped down the tube and set off with timers or depth sensors. One variation is to pour explosive ingredients down the tube to the sphere, then set them off with electrodes.

The American approach does away with the perforated sphere. Instead, a highly-conductive liquid is poured into the water between a pair of electrodes, which vaporize it into a superhot plasma. This forms a huge bubble of hot steam which then collapses to produce shock waves that are predominantly low-frequency. The increased low-frequency content helps obtain data from as far as several miles below the water bottom. (Reprinted with permission from "Science News," weekly summary of current science, copyrighted 1966 by Science Service, Inc.)

STATES

California

FISH & GAME DEPT. ISSUES
1968 ANNUAL REPORT

The 1968 annual report of California's Department of Fish and Game, which appears in 'Outdoor California' March/April 1969, reflects the Department's extensive activities in the fisheries. Here are some highlights:

I. INLAND FISHERIES

In 1967-68, its fish hatcheries "produced 39,248,896 resident, anadromous, and warmwater fish weighing a record 2,705,759 pounds." Of this total, 25,384,457 were trout and kokanee, 13,604,310 salmon and steelhead, and 260,129 warmwater fish.

The Department planted 900 back country lakes by air with 6 million fingerling trout. It was this program's 20th year. Aerial planting "has reduced the cost of planting from $18.75 to $1.43 per thousand fish."

The proposed warmwater hatchery site in Imperial Valley was tested successfully. The Department will build this facility to raise 500,000 one-half-pound channel catfish a year to stock southern California waters.

Proceeding on schedule is construction of the $2.2 million Mad River Salmon and Steelhead Hatchery. It will be completed this year and produce 1,000,000 yearling and 5,000,000 fingerling salmon and steelhead to stock north coast streams.

Valuable Research Information

The annual report states that several research projects have produced valuable information on fishery management. For example:

"The Salton Sea study disclosed that a salinity of about 40 parts per thousand is the maximum tolerated by eggs and young fish. This means that the increasing salinity of the sea must be controlled before it reaches this level, to protect the great fishery there."

Sturgeon tagging will enable the Department to closely watch the rising catch of sturgeon and determine management needs. A large striped bass tagging program is expected to gain information on the "total population, recruitment, harvest, and natural mortality of this fish."

A coldwater reservoir study "determined the optimum size and strain of trout fingerlings and the best time to plant for maximum returns." This will enable biologists to provide better trout fishing at lower cost.

II. MARINE RESOURCES

The 1968 commercial fish catch was expected to drop 10% from 1967 landings of 503 million pounds. This would reflect lack of anchovy fishery during early 1968 and drop in skipjack landings from 1967's high level. "Tuna landings account for over half the catch, as is the usual case."

Eight Department-tagged bluefin were recovered off Japan--and 2 Japanese-tagged bluefin off California. "This indicates Japanese and America fishermen are harvesting the same stocks."

"The crab resource appears to be coming back in the San Francisco area and is healthy off the North Coast."

Estimates of the shrimp population were high enough to permit a quota increase from $1\frac{1}{2}$ to 2 million pounds during 1968.

Exploration for prawns showed populations large enough "to support moderate fisheries off Monterey and Catalina."

Anchovies

During last season, the reduction fishery landed "only 6,500 tons of anchovies," nearly all from Monterey Bay. "Low landings were due chiefly to adverse economic conditions and the failure of commercial size schools to form in near-shore waters."

Since March 1966, 369,300 anchovies were tagged, 178,700 in 1968; 755 tags were recovered, 240 in 1968.

Live Bait

Reported live bait landings were expected to reach a record 7,000 tons. This is

"primarily because of improved contact with fishermen and better catch reports."

Sea Otters

Censuses revealed 576 sea otters between Monterey Bay and Morro Bay.

A legislature-authorized sea otter project was begun. Its purpose is "to reduce competition for abalone." Sea otters will be trapped where commercial fishermen harvest red abalone and be transported to the sea otter refuge.

III. SALMON & STEELHEAD

Because of "continued declines in fishery landings and spawning runs of Central Valley king salmon stocks," the Department recommended sport fishery restrictions to the Fish and Game Commission.

The Department emphasized that "the salmon decline is not the fault of sport or commercial fishermen, but rather is a combination of problems which have reduced the survival of young salmon. These factors included unscreened irrigation diversions, gravel siltation and removal, predation, pollution, vegetation encroachment on spawning riffles, inadequate water flows, and fluctuations of water temperatures due to natural or other causes."

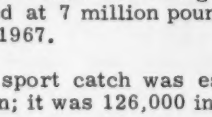
The salmon fishing restrictions recommended by the Department are designed "to prevent further declines in salmon stocks until we can solve the long range problems facing the resource."

Salmon Landings

Commercial salmon landings for 1968 were estimated at 7 million pounds, a half-million below 1967.

The ocean sport catch was estimated at 176,000 salmon; it was 126,000 in 1967.

Sacramento River sport landings were estimated at 17,000 king salmon and 19,700 steelhead.



Oregon

WILLAMETTE STEELHEAD POPULATION INCREASED IN STATE PROGRAM

The Oregon Fish Commission has announced that more than 3,500 adult winter steelhead were transplanted into Willamette River tributaries during December 1968 and January-February 1969 in the third year of its program to develop the Willamette system's natural spawning potential for winter steelhead.

The early-run fish were surplus to egg-take requirements and stream needs at the commission's Big Creek and Klaskaine hatcheries. The fish were trucked and released into Willamette Valley streams devoid of winter steelhead or having only a few.

Adult-Hauling Program Successful

Success in the adult-hauling program was verified recently by a survey of spawning nests (redds) on 4 of the planted streams.

Earlier counts over Willamette Falls seemed to substantiate success of attempts to introduce an early run. The first winter steelhead passing the counting chamber at Willamette Falls' new fishway was recorded on Sept. 22, 1968; by the end of Dec. 1968, over 2,500 steelhead had been counted over the falls. In past years, no significant number of steelhead had been recorded over the falls prior to January or February.

Another Program Helped Too

The earlier arrival of steelhead at the falls, however, results partly from another Fish Commission program. In 1968, in an effort to establish an earlier run and develop unutilized natural spawning areas, the Fish Commission completed an extensive 4-year steelhead smolt liberation program on the Yamhill River. During the past 2 years, spawning adults from these plants also have been verified by Fish Commission biologists.

The Commission states that development of an early run of winter steelhead is desirable. Steelhead fishing could be spread over a longer period, and 'the sportsmen given a bonus run to go after before the wild stocks of steelhead and spring chinook hit their peaks.'

* * *

GOVERNOR DEDICATES ULTRAMODERN ELK RIVER SALMON HATCHERY

Governor Tom McCall formally dedicated on April 18 the Oregon Fish Commission hatchery at Elk River. The dedication capped 3 years of planning and construction in cooperation with BCF.

The hatchery is near Port Orford. The planners made it attractive and functional--without disturbing the site's natural beauty. All electrical hookups were laid underground. Unobtrusive pumping systems carry water to the rearing ponds.

The Hatchery

The hatchery will provide the salmon stock for the major tributaries of southern Oregon. Plans call for rearing about 1 million fish in the first year: 850,000 fall chinook and 150,000 coho. Liberation is planned for the Elk and Chetco systems and the Floras Lake area.

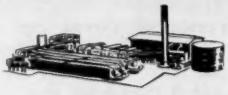
Hatchery fish will be kept in rearing ponds as long as they normally would spend under natural conditions in the streams. Then they will be liberated and return directly to the sea. This will ensure that hatchery fish do not compete with wild fish in the streams; it will allow natural spawning to continue under "the most fruitful circumstances." The Commission states: "Couple the hatchery migrations and the natural migrations, and the outlook for total southern Oregon fish production assumes exciting proportions."

The equipment will feature Burrows rearing ponds. This design keeps the water circulating in the ponds at all times and the fish swimming. The result is much stronger fish with greater endurance. This leaves little opportunity for sick fish to congregate in quiet water.

The ponds are self-cleaning and are expected to result in a much higher survival rate. Also, adult holding ponds have been built with a fishway and support buildings housing freezer storage of the "Oregon Pellet," shop, garage, electrical control equipment, and incubation room. A stream bed filtration system will draw water from the river and carry it to the hatchery ponds. So continuous circulation essential to healthy hatchery programs will be provided.

Continuing Research

Continuing research will play a part. Studies of the early life history of the fall chinook in the area will be undertaken. A biologist will work in the Elk and Sixes areas. Overall potential of the Curry County streams will be under continuous scrutiny. Complete cost of the Elk River hatchery, the 15th under Fish Commission jurisdiction, was $476,000. This includes the hatchery facility and 3 houses for personnel and families.



Texas

8,000 TAGGED SHRIMP RELEASED

BCF and the Texas Parks and Wildlife Dept. released 8,000 tagged brown shrimp off the upper Texas coast during February and March. BCF is offering a reward of $2 for each tagged shrimp returned along with information on where and when it was caught.

Biologists will use information collected from this experiment "to estimate shrimp abundance, winter survival, and spawning potential of brown shrimp remaining on the grounds."

Growth rates and movements of shrimp also will be studied. This information will help to determine the effects of fishing on shrimp stocks and the proper timing of the shrimp harvest to insure maximum annual catch.

Tag

The tag consists of 2 small green disks held on either side of the shrimp's tail by a slender wire, which passes through the shrimp. Fishermen who catch these tagged shrimp should freeze or preserve the entire shrimp along with the tag.

BCF personnel will visit shrimp houses regularly to collect tagged shrimp and pay rewards. Rewards will not be paid unless information on exact location and date of capture are recorded.

* * *

A Preliminary Review of the Potential Deep-Water Fishery Off Texas Between 50 and 300 Fm.

R. Spencer Gaille

The Texas Parks and Wildlife Department commenced systematic bottom trawling between 50 and 300 fm. off the Texas coast in July 1967. The primary objective was to determine the abundance, distribution, and seasonal occurrence of royal red shrimp, Hymenopeneus robustus, and potentially valuable industrial fish species. A need exists for supplemental fish and shellfish raw material during seasons or years when commercial quantities of brown and white shrimp are not available.

The 'Western Gulf,' a 72-foot steel shrimp trawler, was used to conduct the preliminary field tests. It is equipped with standard oceanographic instruments and winches capable of trawling to depths of 500 fm. Shrimp trawling gear consisted of a single 45-foot, $2\frac{1}{4}$-inch, nylon stretch mesh flat otter trawl.

ROYAL RED SHRIMP

Results of deep water work by the 'Oregon' (Springer and Bullis, 1956, Bullis and Thompson, 1965) indicated that commercially exploitable quantities of royal red shrimp were not available off the Texas coast. Their catches of 5-30 pounds per 3-hour drag with 80- and 100-foot trawls southeast of Port Aransas, Texas, were extremely small when compared with catches of 90-120 pounds per 3-hour drag east of the Mississippi Delta. However, the Oregon occupied only 30 trawl stations off Texas in the depth zone inhabitated by royal red shrimp. The small number of stations occupied suggests that further trawling effort is needed.

The maximum yield per 2-hour tow in over 75 attempts by the Western Gulf was 25

Photo: Texas Parks & Wildlife Dept.

Mr. Gaille is a Marine Biologist, Texas Parks and Wildlife Dept., Rockport, Texas.
This study was conducted in cooperation with BCF under PL 88-309 (Project 2-47-R).

pounds; usually less than 5 pounds was caught. These results, then, substantiate those of the Oregon.

FISH OF INDUSTRIAL OR MARKET VALUE

Three species of trawl-caught demersal fish were taken in samples from 50 to 100 fathoms, the wenchman snapper (Pristipomoides andersoni), the scalyhead scorpionfish (Pontinus longispinis), and the spotted hake (Urophycis regius).

The wenchman snapper varied in weight from $\frac{1}{4}$ to $\frac{3}{4}$ pound and averaged $\frac{1}{2}$ pound. It possesses the typical qualities of a panfish having firm flesh and above-average taste. Mosely (1965) did some unpublished age determination research on wenchman from the Gulf of Mexico. Little else has been done on its life history or commercial possibilities.

This small reddish snapper schools over rough and mud bottom. Individual fish are believed to be scattered thickly along the bottom with dense circular schools often extending upward 20 feet. Over 400 pounds were caught in a 2-hour drag at a depth of 80 to 90 fathoms east of Port Isabel, Texas, in November 1967 with a 45-foot, 3-inch stretch mesh fish trawl. There are no estimates of catching efficiency of the 45-foot standard shrimp trawls which produce sizable catches of wenchman at times. While this type of net is not adapted to the capture of bottom dwelling fish, catches do indicate the availability of several fish species which may warrant further explorations with suitable gear for a gross determination of abundance.

Scalyhead scorpionfish, averaging $\frac{1}{3}$ pound, were common from 70 to 130 fathoms. Spotted hake, which averaged $\frac{1}{2}$ pound, were narrowly confined to the 90-fathom zone.

Table 1 - Numbers, Weights, and Lengths of Wenchman Snapper, Scalyhead Scorpionfish, and Spotted Hake, Taken in 1-Hour Trawls at Depths of 40, 50, 70, 90, 130, and 165 Fathoms with a 45-Foot, $2\frac{1}{4}$-Inch Stretch Mesh Trawl East and Southeast of Port Aransas in July and October 1967

Depth	Wenchman Snapper			Scalyhead Scorpionfish			Spotted Hake		
	No.	Lb.	Length mm.	No.	Lb.	Length mm.	No.	Lb.	Length mm.
40	0	-	-	0	-	-	0	-	-
50	50	25	120-210	0	-	-	0	-	-
70	75	35	120-200	25	9	130-200	0	-	-
90	100	48	110-200	50	17	90-150	30	15	220-450
130	10	5	120-170	30	12	110-170	0	-	-
164	0	-	-	0	-	-	0	-	-

Only small number of the Gulf silver hake (Merlucius magnoculus) were caught in 1967. Subsequent efforts in 1968 produced generally the same findings with the Gulf hake, U. cirratus, continuing to be the predominant species between 130 and 300 fm. Table 2 provides catch information and depth distributions for the 2 species in 1967.

Table 2 - Numbers, Weights, and Lengths of Gulf Hake, and Gulf Silver Hake Taken in 1-Hour Trawls at Depths of 130-300 fm. with One 45-Foot, $2\frac{1}{4}$-Inch Stretch Mesh Trawl East and Southeast of Port Aransas in July and October 1967

Depth	Gulf Hake			Gulf Silver Hake		
	No.	Lb.	Length mm.	No.	Lb.	Length mm.
130	32	37	150-320	8	4	160-225
165	58	40	110-460	2	1.5	190-220
200	84	40	240-510	3	2	205-380
250	10	12	240-310	6	6	200-310
300	15	18	250-500	11	8	300-380

SUMMARY

Royal red and associated deep water penaeid shrimp have been found in only small numbers during explorations of the 200-300 fm. depth zone. The commercial fishery potential of these shrimp in deep water off the Texas coasts is doubtful.

Wenchman snapper are excellent panfish, and are known to inhabit the 50-100 fm. depth interval. Further investigations directed to determining abundance might be practicable because it is a commercially interesting species that may exist in commercial quantities.

Similarly, beyond 100 fm. the Gulf hake (Urophycis cirratus) may exist in quantities suitable for commercial harvest. This species is less desirable than wenchman snappers in terms of palatability; it would probably be considered as an industrial species if and when it is commercially utilized.

LITERATURE CITED

BULLIS, HARVEY R. Jr. and J. R. THOMPSON
1965. Collections by the exploratory fishing vessels 'Oregon,' 'Silver Bay,' 'Combat,' and 'Pelican' made during 1956-1960 in the southwestern North Atlantic. U.S. Fish Wildl. Serv. Spec. Sci. Rep.-Fish. 510, 130 pp.

MOSELY, FRANK N.
1965. Preliminary investigations of the applicability of the scale method of age-growth determination in Pristipomoides andersoni. Student Rep., Inst. Mar. Sci. Univ. Tex., 12 pp.

SPRINGER, STEWART and HARVEY R. BULLIS, Jr.
1956. Collections by the 'Oregon' in the Gulf of Mexico. U.S. Fish Wildl. Serv. Spec. Sci. Rep.-Fish. 196, 134 pp.

LONGLINING FOR SWORDFISH IN THE EASTERN PACIFIC

Susumu Kato

'Blue Belle' returned to Morro Bay, California, early in February 1969 with a load of broadbill swordfish (Xiphias gladius) caught by longline gear. She was the first California-based commercial vessel to attempt longlining for swordfish on a large scale. Captain Wayne Smith became interested in trying this method of fishing after learning of a successful longline trip by the BCF research vessel 'David Starr Jordan' in November 1968. Upon learning of his interest, the Bureau loaned its gear to Blue Belle and she sailed with a crew of four on January 16 from San Pedro, California.

Fishing Gear and Methods

Blue Belle is 55 feet long with a beam of 14 feet, and has a refrigerated holding capacity of 15 tons. The components of BCF longline gear used by Blue Belle are shown in figure 1. This gear was patterned after that used by east coast American and Canadian fishermen. A radio transmitter, a radar reflector, and a flashing-light buoy aided in the recovery of the gear. Flag buoys were spaced at five-float intervals. Specially constructed boxes (fig. 2) facilitated handling and storage of dropper lines and hooks. A hydraulic reel,

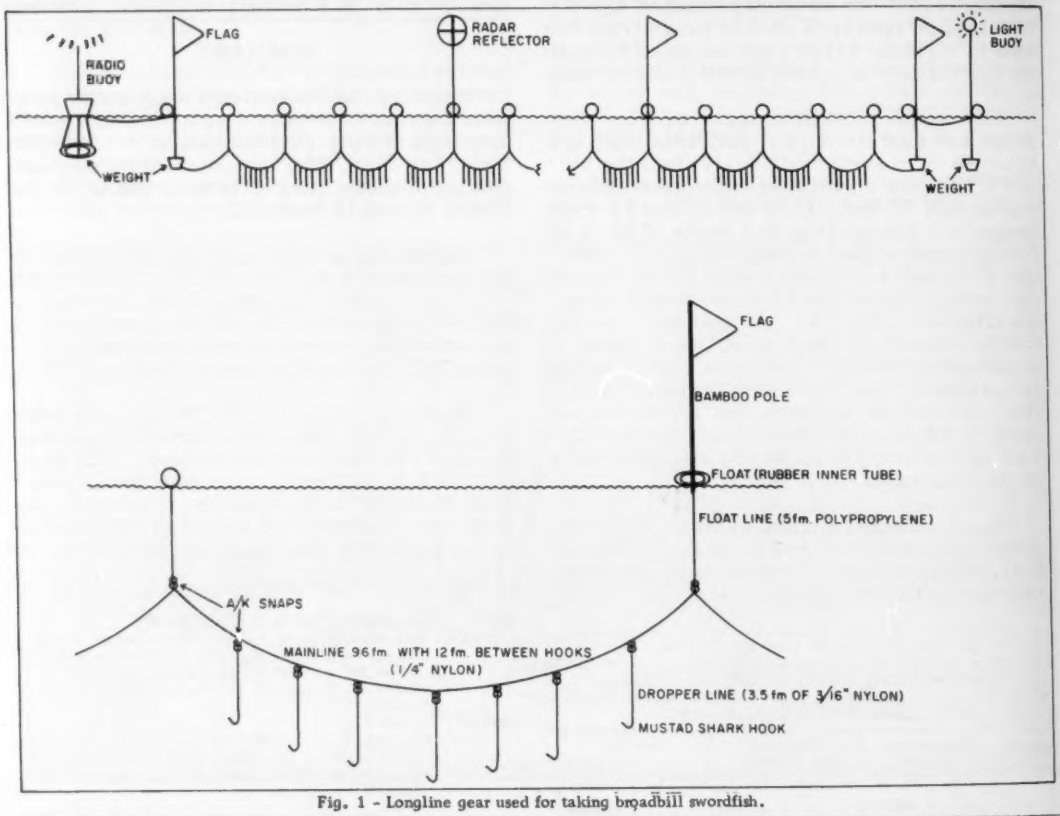


Fig. 1 - Longline gear used for taking broadbill swordfish.

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Fish and Wildlife Service
Sep. No. 837

powered with an automobile transmission and a chain drive (fig. 3), was used to haul and store the mainline. Bait consisted principally of frozen jack mackerel, Trachurus symmetricus.

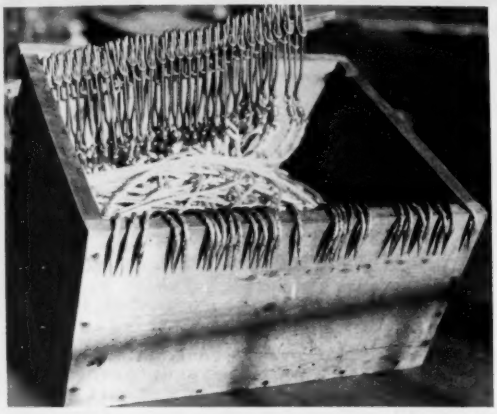

Fig. 2 - Dropper line storage box, with hooks ready to be baited.

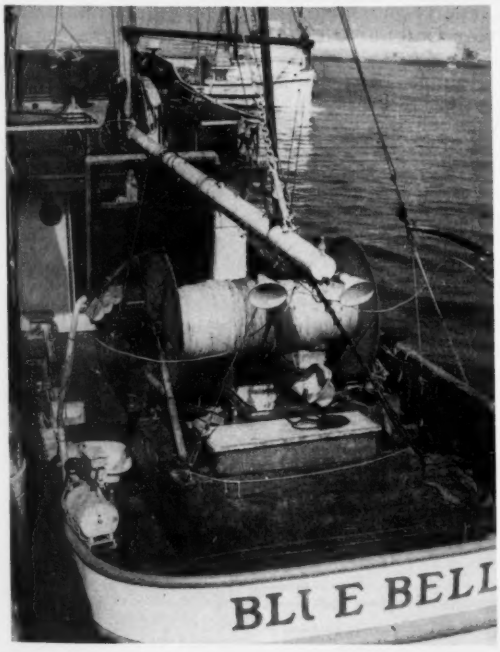

Fig. 3 - Powered reel for the mainline used by Blue Belle.

To set the longline, the vessel was steered downwind at about 3.2 knots and the line allowed to pay out freely. One man baited the hooks and threw them overboard, while passing the snap ends to a second man who attached the dropper lines to the mainline. A third man handled the floats and flags, while the captain kept the ship on course.

During retrieval of the line, one man controlled the speed of the reel and unsnapped the dropper lines as they came aboard, two men coiled the dropper lines in the storage boxes and handled sharks, while the captain maneuvered the ship. All hands aided in landing swordfish.

All sets were made just before sunset, and hauling was started at dawn. Ten sets (total of 4,208 hooks) were made in international waters offshore from central Baja California, near the 1,000-fathom contour. Surface-water temperatures in this area--67.5 to 70.5° F.--were determined from a bathythermograph cast made before each set.

The Catch

A total of 33 swordfish were caught (figs. 4 and 5), of which one was lost due to extensive damage by sharks. The catch rate of the entire trip was 0.8 swordfish per 100 hooks fished. Every set produced at least one swordfish; the best day's catch was nine fish on a 392-hook set. The total dressed weight of the landed swordfish was about 2.5 tons (average weight 156 pounds). The fork length (tip of lower bill to fork) of the fish ranged from 36 to 109 inches (dressed weights 20-360 pounds). Gonads of 29 fish collected by the fishermen indicated that 93 percent of the fish were females. None of the ovaries were in an advanced stage of development.

Other fish in the catch included one striped marlin (Tetrapturus audax), a few dolphin (Coryphaena hippurus), about 1,500 blue sharks (Prionace glauca) and 83 other sharks representing five species.

Future Prospects

The large number of blue sharks encountered presented the greatest problem to the fishermen. The sharks caused extensive tangling, often cut the mainline, and slowed hauling to an average of 80 minutes per 100

Fig. 4 - Unloading swordfish at San Pedro.

hooks. Further, their competition for bait appreciably decreased the baits available to swordfish. The abundance of sharks also limited the amount of hooks Blue Belle could set to about 350 rather than the anticipated 800 to 1,000 hooks per set. Despite the problems with sharks, the catch rate of 0.8 swordfish per 100 hooks was encouraging.

Captain Smith is preparing for a second longlining trip. Another vessel will probably enter the fishery shortly. Both vessels will carry gear on loan from BCF. Although availability of swordfish may be relatively low at this time of year, the high price paid for the fish will compensate somewhat for low catches.

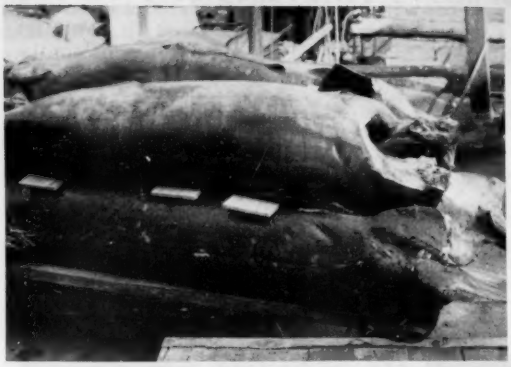

Fig. 5 - Part of the catch.

Longlining for swordfish seems especially suitable for the large albacore jig boats, which are readily adapted to this type of fishing. This fishery may be particularly attractive to albacore fishermen because swordfish apparently are available in greatest numbers from October through January, and the albacore season usually terminates around late October. Little is known about the availability of swordfish from February through August.

Annual California landings of swordfish have never exceeded 250 tons since the peak year of 1948, when 550 tons were landed. Swordfish have been caught exclusively by harpooning, which requires good weather and availability of fish on the surface; thus, harpooning is restricted to about 4 months, from July through October. Swordfish could be harvested for an additional 3 months or more by longlining.

METHOD FOR PROTECTING LAKE TROUT TAKEN IN TRAWLS

Alfred Larsen and Warren Handwork

A rescue device for returning live fish to below-surface depths was used to increase survival of lake trout (Salvelinus namaycush) caught during BCF exploratory trawling in Lake Superior. Lake trout stocks, now being rehabilitated in Lake Superior and other Great Lakes after near extinction by the sea lamprey (Petromyzon marinus), cannot be fished commercially at the present time. The development of an effective method to return live fish to their habitat was prompted by incidences of losing trout to predation by gulls when the fish were released on the surface after their removal from the trawl net. Many lake trout were unable to swim down from the surface upon release because air bladders expand at lower pressures as fish are brought to the surface. Trout that had been returned to the lake often were observed swimming at or near the surface for long periods trying to submerge. During these periods the fish are extremely vulnerable to preying gulls. In 1967, the trout rescue cage was tested successfully aboard the chartered commercial trawler 'A. E. Clifford' during exploratory trawling in Lake Superior.

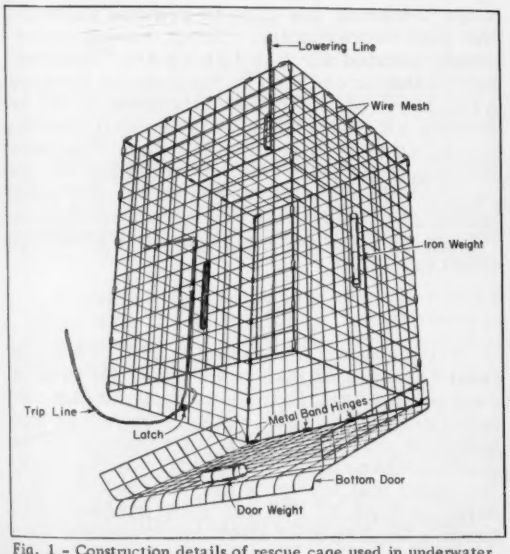

Fig. 1 - Construction details of rescue cage used in underwater method of releasing lake trout.

EQUIPMENT

The trout rescue cage is a rectangular wire-mesh container, which measures 2 by $1\frac{1}{2}$ by $1\frac{1}{2}$ feet, constructed of 1-inch square mesh, 14-gauge, galvanized wire (figs. 1, 2, 3, and 4). The interior of the cage was later lined

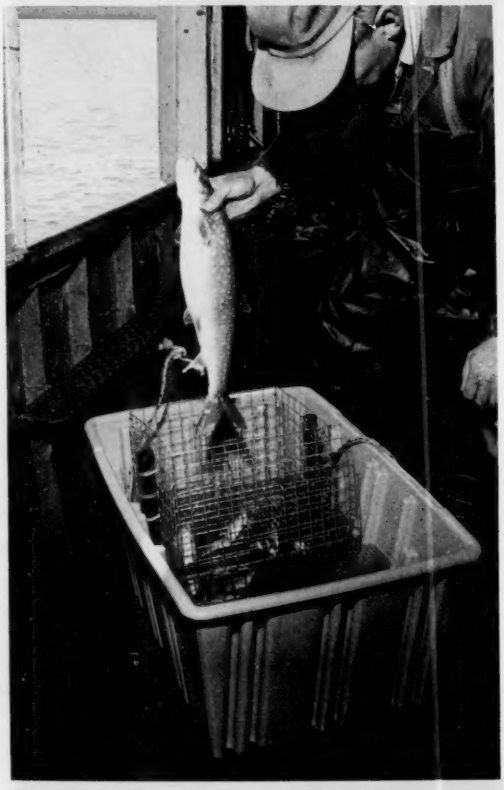

Fig. 2 - Fisherman placing a lake trout into the rescue cage.

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Sep. No. 838

Fig. 3 - Lake trout in the rescue cage about to be lowered into the water.

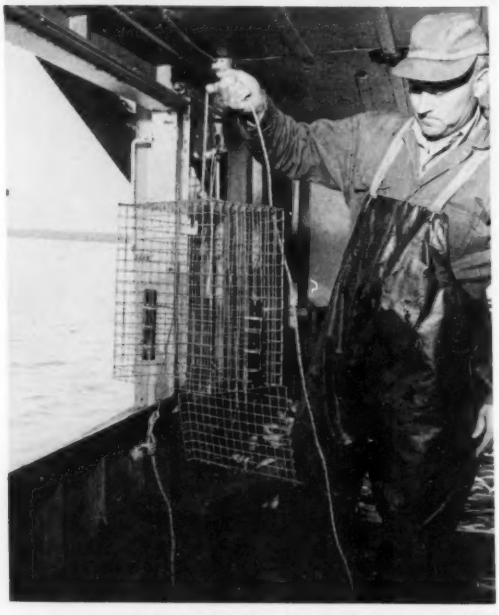


Fig. 4 - The rescue cage after fish have been released.

with $\frac{1}{4}$-inch square mesh hardware cloth to retain small trout. The bottom panel of the cage is hinged and held closed by a spring wire formed into a latch fastened to a side of the cage. A $\frac{1}{4}$-inch nylon line is used to disengage the spring-wire latch that opens the bottom door for releasing the fish. Another $\frac{1}{4}$-inch nylon line, tied to the center of the top of the cage, is used for lowering the cage to the desired depth. A 6-ounce lead weight, which is fastened to the bottom panel on the side opposite to the hinges, furnishes the force needed to pull the panel open when the latch is released. Two 1-pound iron pipe weights are lashed to opposite sides of the cage to help sink it faster.

PROCEDURE

Trout captured in the trawl are immediately sorted from the catch and placed in a 30-gallon recovery tank with circulating water (fig. 2). When the fish appear to be in good condition (swimming normally), the vessel is stopped. The trout are then placed in the rescue cage, lowered to a depth where water pressure is greater (thus recompressing the inflated air bladders), and released (figs. 2, 3, and 4). The trip line must be kept slack when lowering the cage to prevent releasing the fish prematurely. Trout having excessively bloated air bladders are "deflated" before they are placed in the cage by applying slight pressure in the belly area, or by inserting a hypodermic needle carefully into the air bladder to remove the air. The latter technique has been used successfully on blue rockfish (Sebastodes mystinus) and ocean whitefish (Caulolatilus princeps) in California (Gotshall, 1964) and on lake trout in Wisconsin (Hacker, 1962).

RESULTS

From January 16 to June 8, 1967, over 100 trial releases of lake trout from the rescue cage were made. Extended visual surface observations after each release revealed that under 10 percent of the trout returned to the surface where they could be attacked by gulls. We found that lowering the rescue cage to a depth of about 30 feet was most successful in keeping the fish down after their release. Observations by means of underwater television showed that upon release the trout dispersed downward from the cage.

CONCLUSIONS

A trout rescue cage, tested during BCF exploratory fishing in Lake Superior, increased the survival of trout that were caught in trawls and brought aboard the fishing vessel. The rescue cage is used to return live lake trout to below surface depths where inflated air bladders become recompressed to help the fish stay submerged. The method was successful in reducing the amount of sea gull predation that occurred when numbers of fish remained on the surface when thrown overboard after removal from trawl catches.

LITERATURE CITED

GOTSHALL, DANIEL W.
1964. Increasing tagged rockfish (genus Sebastodes) survival by deflating the swim bladder. California Fish and Game, Vol. 50, No. 4, pp. 253-260.

HACKER, VERNON A.
1962. A summarization of life history information of the lake trout, Salvelinus namaycush, obtained in gill netting, finclipping and tagging studies at Green Lake, Wisconsin - 1956-1961. Wisconsin Department of Natural Resources, Bureau of Fish Management, East Central Area, Investigational Memorandum No. 3, 24 pp.

OYSTERS OPENED BY MICROWAVES

BCF scientists have developed a technique to open oysters by using microwaves. The oysters are exposed to enough microwave energy to open them--but not enough to cook them. When open, they are easy to shuck.

Persons who ate the oysters could find no difference in "flavor, odor, or appearance" between microwave-treated oysters and those shucked normally.

The oyster-shucking industry may be changed drastically because the new technique eliminates the need for expert hand shuckers of which there is a shortage. BCF is striving to refine the process and to extend its use to other shellfish that are difficult to open.

A BCF scientist tests the microwave technique for opening oysters or clams.

--Harold Allen

SOUTH KOREAN FISHERIES OFF ALASKA

Virgil N. Crosby

After a disastrous expedition by the Samyang Fisheries Co. in 1967, the same fleet returned to Alaska in 1968 with the addition of one refrigerated support vessel. A second company, the Korean Marine Industry Development Corp., made its initial venture in 1968 to the grounds off Alaska. It sent one stern trawler on 2 expeditions to the eastern Bering Sea. Production, mostly walleye pollock, was low.

The first interest by the Republic of Korea in fishing the grounds of the northeast Pacific Ocean and eastern Bering Sea was demonstrated in 1966. A single exploratory vessel worked along the Aleutian Islands, in the eastern Bering Sea, and into the Gulf of Alaska as far east as Kodiak. In fall 1967, the Samyang Fisheries Co. sent a refrigerated processing and support ship and 8 pair trawlers to the fishing grounds off Alaska. Enroute, 2 trawlers and 29 crew members were lost in a violent storm south of the Aleutian Islands. This tragedy was compounded by adverse climatic conditions that plagued the fleet for its entire stay. Catches were small, primarily walleye pollock (Theragra chalcogrammus). The fleet returned to Pusan in mid-November and landed only a few tons of fish; the rest was eaten by the crew. The 1967 expedition resulted in financial, vessel, and human losses.

In 1968, the Samyang fleet--the 957-gross-ton 'Sam Su No. 301' and the remaining 6 pair trawlers, the 'Sam Su Nos. 2, 3, 5, 6, 9, and 10,' returned to the grounds off Alaska in early May. They were joined in early June by the 'Sam Su No. 201,' a refrigerated transport of 828 net tons. The principal fishing grounds were around the Fox Islands in the eastern Aleutians, and west of the Pribilof Islands in the Bering Sea. The Samyang fleet departed the Alaskan area in mid-July 1968 and returned to Korea with over 800 metric tons, mostly walleye pollock with some flounder and cod.

Fig. 1 - South Korea's Sam Su No. 301, anchored at Kodiak, Alaska, was built in Japan in 1956. She and her fleet of trawlers were part of war reparations by Japan to Korea. The ship is 213 feet long and carries 67 men.

Mr. Crosby is Fisheries Management Agent, BCF, Office of Enforcement and Surveillance, Kodiak, Alaska.

The Koreans had hoped to catch herring but were unable to find any. As in 1967 the fleet was beset by technical troubles, although minor compared to 1967. One trawler ran aground, several experienced mechanical difficulties and one hit an iceberg.

In early June the 6 trawlers were authorized to enter Akutan harbor while their support vessel sailed to Sand Point to pick up new radio equipment. Several crew members went ashore illegally and were fined US$10,000 by the U.S. Immigration Service.

BCF Agents Visit

BCF Fisheries Management Agents visited both the Sam Su No. 301 and Sam Su No. 201. Vessels of the Samyang fleet were part of the war reparations received from Japan. None of the vessels had fresh water-making capabilities. As of June 25, 1968, the fleet's total catch was reported as 350 metric tons, consisting of nearly 100 percent walleye pollock. Average catch by the fleet per fishing day was about 30 metric tons.

The fish were salted in the round and placed in burlap bags, each bag containing about 50 pounds (25 kilograms) of pollock. Then, they were frozen and kept under refrigeration in the holds of the processing ship, or on the accompanying refrigerated transport.

The Trawlers

Trawlers of the Samyang fleet are Japanese built, 100 gross tons, about 90 feet long with a 5-foot draft, and can make 8 knots. Each trawler has 15 crew members. The vessels work as pair trawlers and their most efficient fishing depth was reported to be 40-50 fathoms.

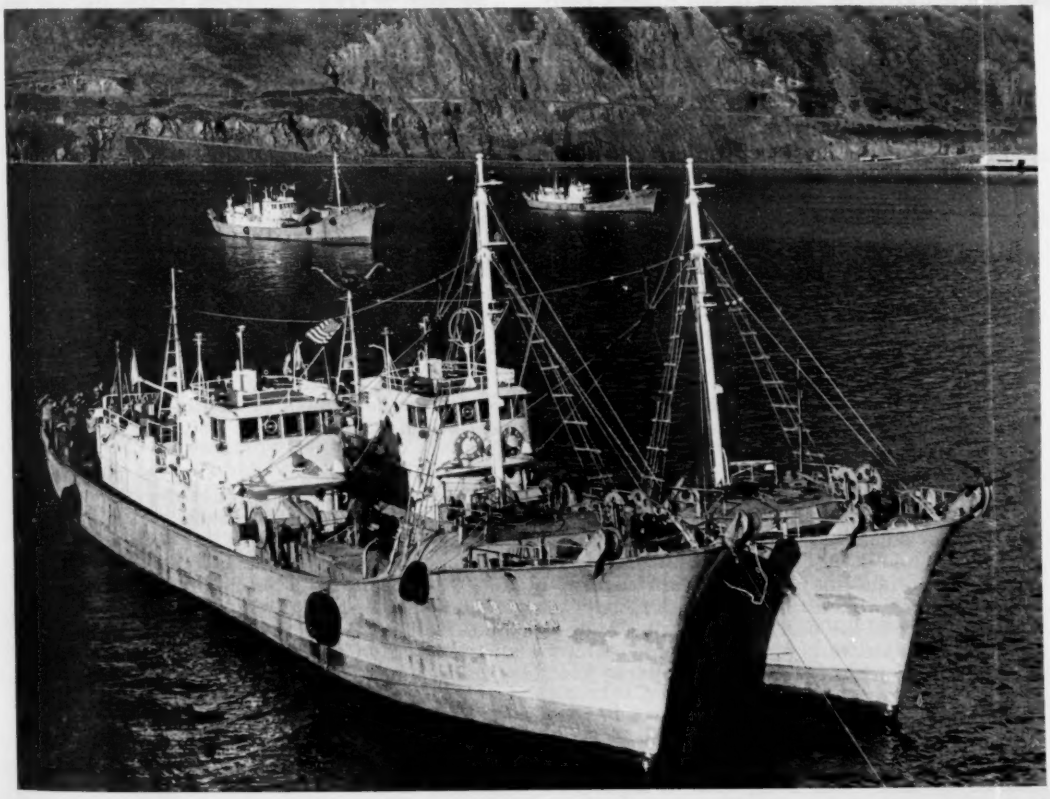


Fig. 2 - The South Korean trawlers in Kodiak Harbor belong to the Samyang Fisheries Co. Built in Japan, the vessels are about 100 gross tons, 90 feet long, have a shoal draft of 5 feet, and speed of 8 knots. Each trawler is operated by 15 men.

A company official aboard the Sam Su No. 201 said that 1967 and 1968 could be considered not merely as test fisheries, but as exploratory fishing.

Second Company

Besides the Samyang fleet, a stern trawler, the 'Kang Wha No. 601,' of the Government owned Korean Marine Industry Development Corp., made at least 2 trips to the fishing grounds off Alaska in 1968. She was first seen in late June in the approaches to Bristol Bay north of Port Heiden on the Alaska Peninsula. The vessel remained in that area for a week and then fished along the Aleutian Islands. She was observed near Attu Island, the western tip of the Aleutians, in mid-July, and indicated she was headed home. In mid-December 1968, she was again reported off Alaska, near the eastern Aleutians, returning to fish the grounds north of the Alaska Peninsula.

Although the Kang Wha No. 601 was observed fishing on several occasions, there were no fish visible on deck, so the exact catch composition is unknown. It was reported that, in mid-July, a stern trawler identified as the 'Kang Hwa No. 602' ended a month-long exploratory fishing cruise in the eastern Bering Sea and returned to Pusan with about 400 tons of walleye pollock and some herring. Available information indicates this stern trawler was probably the Kang Wha No. 601 and that the Kang Hwa No. 602, which was to fish for shrimp in the eastern Bering Sea, never operated in the Alaskan area.

Future S. Korean Fishing

The future of South Korean fishing off Alaska is uncertain. It is unlikely that the 1968 expeditions by either Korean company was highly profitable. In November, however, a Japanese news article reported that the S. Korean Government planned to support expansion of trawl fisheries in the Bering Sea and North Pacific Ocean. The fishery resources on Alaska's vast Continental Shelf have already lured large fishing fleets from Japan and the USSR.

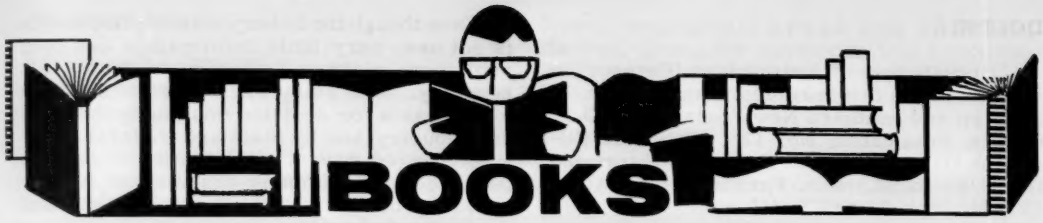
ARE ALL FISHES EDIBLE?

Not all fishes are edible. Some have organs that are always poisonous to man; others sometimes become toxic because of certain elements in their diet. In Japan, a national dish called fugu is highly prized. It is prepared from the puffer fish, and the gonads of the puffer are highly poisonous. For this reason, fugu is only served in restaurants licensed by the government.

Consumption of sharks and rays has been known to cause illness or death; this was probably because the victim ate a portion of the liver, which contains a very high concentration of vitamin A that the human body cannot tolerate.

There are 300 tropical species of fishes that cause fish poisoning; one type of poisoning is commonly known as ciguatera. A particular species may cause ciguatera when caught on one side of an island, but not if caught on the other side. These tropical fish are associated with reefs and do not usually venture far from the home reef; for this reason, the people living on one island may eat a certain species of fish, while those on a nearby island would not. No one knows what causes the fish to become poisonous, but most investigators agree that it is something in the diet. There is no method to determine before a fish is consumed whether or not it will cause ciguatera. Some common species of fish known to cause ciguatera are: surgeon fish, jacks, porgies, snappers, goatfish, moray eels, wrasses, and barracudas.

Scombrid fish, commonly known as tuna or mackerel, have been known to cause scombrid poisoning, usually because of inadequate preservation. The flesh of scombrid fish contains bacteria which, if the fish is not preserved soon after capture, begin to produce a histamine-like compound. This compound, if ingested by humans, causes a severe allergylike reaction and may even lead to death. ("Questions About The Ocean," U.S. Naval Oceanographic Office.)



ANCHOVETA (PERU)

"Dynamics of the Fishery for the Anchoveta, Engraulis ringens, off Peru," by Milner B. Schaefer, Boletin, Vol. 1, No. 5, Instituto del Mar del Peru, Callao, 1967, pp. 189-304, in English and Spanish.

It has been known for a long time that a very large quantity of anchoveta, along the coast of Peru and northern Chile, formed the principal food for a large guano bird population and for the larger predatory fishes. The utilization for fish meal of anchoveta caught by purse-seine vessels, known in Peru as 'bolicheras,' began in the early 1950s. The fishery grew from a modest 7,000 tons in 1951 to 9.8 million in 1967. Before and during the development of the fishery, there were fears that it would lead to disastrous consequences for both guano birds and anchoveta. This concern about the proper development and control of the resource had the fortunate consequence of providing one of the few instances when adequate statistical and biological data have been collected and analyzed during the early development of an important commercial fishery.

Data on catch, effort, size composition of the catches, and information on the biology and ecology of the anchoveta have been collected. This has made it possible to insure against both overexploitation and premature curtailment of exploitation.

Dr. Schaefer has examined the population structure and biology, measurement of the catch, fishing efforts, and apparent abundance of the anchoveta. Estimating the relation of catch, effort, and catch-unit-of-effort, he has concluded the average maximum sustainable yield to be 10 million tons, divided between guano birds and man.

BLUE CRAB

"Growth of Juvenile Blue Crabs, Callinectes sapidus Rathbun, in the St. John's River, Florida," by Marlin E. Tagatz, Fishery Bulletin, Vol. 67, No. 2, Fish & Wildlife Service, Dept. of the Interior, 1968, pp. 281-288, illus. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

Information on crab growth is needed to estimate the time required for any particular size to reach harvestable size. This is a report on studies of growth increments, molt intervals, and the effects of salinity and temperature on juvenile blue crabs in the St. John's River, Fla. Estimates in increase--and of width with age--indicate that most blue crabs in the river reach harvestable size (width of 120 mm.) within 1 year after hatching. Relative growth was studied by holding juveniles in anchored floats.

COMMUNIST CHINA

"Economic Aspects of the Fishing Industry in Mainland China," by Jan J. Solecki, Institute of Fisheries, Univ. of British Columbia, Vancouver, 1966, 172 pp.

The reported expansion of mainland China's fisheries to the point where she may be the second or third greatest producer in the world has naturally aroused a great deal of interest. Unfortunately, there are very few data documenting this phenomenal expansion. Mr. Solecki reviews the history of the freshwater and marine fisheries, summarizes the scattered literature available, and touches on the social and economic features affecting the resource. Most of the information has been derived from Chinese releases and may be biased to show how much fishery production has increased under communism.

DOLPHIN

"Distribution of Delphinidae (Cetacea) in Relation to Sea Surface Temperatures off Eastern and Southern New Zealand," by D.E. Gaskin, Publication No. 126, Fisheries Research Division, New Zealand. (Reprinted from 'N. Z. Jl. mar. Freshwat. Res.', pp. 527-34, Sept. 1968.)

Mr. Gaskin analyzes the records of 4 species of Delphinidea, in waters east and southeast of New Zealand in relation to surface temperatures. He suggests that distributions of dolphin species off the east coast of New Zealand are closely associated with certain temperature ranges and, consequently, with specific water masses and convergence regions.

HERRING

"Spawning, Distribution, Survival and Growth of Larval Herring (Clupea harengus L.) in Relation to Hydrographic Conditions in the Bay of Fundy," by Naresh Das, Technical Report No. 88, Fisheries Research Board of Canada, 1968, 156 pp., illus.

Herring, one of the most commercially abundant fish in the Bay of Fundy-Gulf of Maine area, is a source of great wealth to the Maritime Provinces and to Canada as a whole. Since changes in distribution and abundance affect the fisheries industry, a sound basis for prediction of seasonal variation of herring must be established. Prediction demands a knowledge of stock origins, its distribution and dispersal to the fishing grounds.

This report, ecological in approach, includes a general study of the spawning areas, seasonal production, distribution of larvae and young herring, survival, and growth, in the Bay of Fundy-Gulf of Maine area as far south as the northern edge of Georges Bank. Mr. Naresh Das also attempts to determine just how much hydrographic conditions influence the availability of herring.

INDUSTRY ANALYSIS

"Economic Analysis of the Commercial Fishery Industry of Georgia," by D. H. Carley, Research Bulletin 37, Georgia Game and Fish Commission, June 1968, 92 pp.

Even though the fishery industry in Georgia is not new, very little information has been published on its contribution to the State's economy. This study was undertaken to provide a basis for decision-making by the fishery industry, and by State and Federal agencies charged with administration of seafood resources. It includes analyses of investments, processing, sales, employment, and the major fisheries.

MACKEREL

"Synopsis of the Biological Data on the Pacific Mackerel, Scomber japonicus Houttuyn (Northeast Pacific)," by David Kramer, FAO Species Synopsis No. 40, Circular 302, Fish & Wildlife Service, Dept. of the Interior, 1969, 18 pp., illus. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

This synopsis is an attempt to bring together all existing knowledge on the identity (nomenclature, taxonomy, morphology), distribution, bionomics, life history, population, fishery, and protection and management of the Pacific mackerel.

MARKETING

"Analysis of Demand for Fish and Shellfish," by J. C. Purcell and Robert Raunikar, Research Bulletin 51, Georgia Game and Fish Commission, 1968, 37 pp.

This is a report based on quarterly household data gathered over 5 years. It investigates the nature and magnitude of the influence of quantifiable socio-economic variates on the demand for fish and shellfish.

NAVIGATION

"Celestial Navigation," by Frances W. Wright, Cornell Maritime Press, Cambridge, Md., 1969, 160 pp., illus., $7.50.

Celestial navigation using the sextant, an accurate timepiece, and the 'Nautical Almanac' is still an extremely important method of navigation. This book provides a quick, easy, and thorough explanation (with realistically worked examples) of the practice of celestial navigation at sea, using simple and inexpensive equipment. The only mathematical requisite is an ability to add and subtract without making a mistake.

OCEANOGRAPHY

"Oceans," by Karl K. Turekian, Prentice-Hall, Englewood Cliffs, N. J., 1968, 120 pp., illus.

This book is an introduction to the study of the oceans, emphasizing the geologic and chemical aspects. It draws on recent data on sounding of the ocean depths and geophysical explorations of the ocean bottoms, and relates them to the geologic history of the oceans and the continents.

Covering a vast range of subjects within the field of oceanography, Dr. Turekian discusses the structure and topography of the ocean floor, the nature and transport of sediments, aspects of the Earth's history during the Ice Age as recorded in ocean-bottom sediments, the circulation and other movements of ocean water, marine geochemistry, and the origin and history of ocean water and ocean basins.

OIL POLLUTION

"'Torrey Canyon' Pollution and Marine Life," edited by J. E. Smith, Marine Biological Association of the United Kingdom, Cambridge Univ. Press, 1968, 196 pp., illus.

After the release of 117,000 tons of crude oil from the tanker 'Torry Canyon,' liberal applications of oil solvent/oil emulsifier mixtures were used to disperse the oil at sea, and to clean the rocks and beaches along 140 miles of the Cornish coast. Based on a 10-week survey, this is a report on the detergents' effect on marine plants and animals.

The investigations provided much new information about the movement of oil at sea, properties of detergents, their dispersal in the sea, and about the pollutants' effects on animals and plants at sea and on the shore.

OYSTERS

"Maturation of Gonads of Oyster, Crassostrea virginica, of different Geographical Areas Subjected to Relatively Low Temperatures," by Victor L. Loosanoff, Reprint, 'The Veliger,' Calif. Malacozoological Soc., Berkley, Calif., Vol. 11, No. 3, Jan. 1969, pp. 153-163, illus.

Dr. Loosanoff describes the comparative progress of gametogensis of oysters of different geographical areas kept in Milford Harbor, Conn., for approximately 3 months, and then subjected to conditioning at relatively low temperatures.

PURSE SEINE

"Designing an Improved California Tuna Purse Seine," by M'nakhem Ben Yami and Roger E. Green, FIR preprint No. 66, 11. 183-207, illus., Oct. 1968. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

In the eastern tropical Pacific, about 50% of the purse seine sets for tuna are unsuccessful due mostly to fish escaping the net during setting and pursing operations. This report describes the design of a proposed purse seine that will largely retain the desirable features of the presently used seine, but will sink faster and use increased webbing with efficiency.

SALMON

"Photographic Atlas of Sockeye Salmon Scales," by Kenneth H. Mosher, Fishery Bulletin, Vol. 67, No. 2, pp. 243-280, 1968, illus., Fish and Wildlife Service, Dept. of the Interior. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

Sockeye salmon is the most valuable species of Pacific salmon in North America. Spending their early lives in fresh water, they migrate to the North Pacific, and finally return to their natal streams to spawn and die. Growth zones form on their scales, recording the growth of each fish. The fresh and salt water zones, differing in appearance, show the years the fish spent in each environment, the year it hatched, and the year it migrated to the sea.

The atlas shows in detail the features of sockeye scales so workers can learn how to interpret them. Photographic plates of the scales, with explanatory text, illustrate variations in scale features. Examples of regenerated, resorbed, and other atypical scales have been included.

SEABASS

"Management of the White Seabass (Cynoscion nobilis) in California Waters," by James C. Thomas, Fish Bulletin 142, California Dept. of Fish and Game, Sacramento, 1968, 34 pp., illus.

The white seabass ranges from Juneau, Alaska, to Magdalena Bay, Baja California. Sport and commercial fishermen esteem it for both prestige and monetary value. A general history of declining and erratic catches in the 1950s indicated that the resource was not stabilized, despite regulations designed to achieve a consistent and relatively high yield.

This is a report on the relative abundance, rate of growth, and age and size composition of the resource. It includes an estimate of survival and mortality rates, and evaluates current management practices in sport and commercial fisheries.

SEAWATER ANALYSIS

"A Practical Handbook of Seawater Analysis," by J.D.H. Strickland and T.R. Parsons, Bulletin 167, Fisheries Research Board of Canada, Ottawa, 1968, 311 pp., illus., C$7.50. Sold by Queen's Printer, Ottawa, Canada.

Intended to be an authoritative reference on seawater analysis, this book provides full working instruction for procedures, found reliable in the laboratory and at sea, that have a sensitivity and precision adequate for most marine ecology studies. In most cases, the methods can be mastered by relatively inexperienced workers.

Although a measurement of the photosynthetic potential of a sample of seawater, or of the growth rate of suspended matter, is not strictly seawater analysis, these determinations are becoming increasingly important in many marine laboratories. A short section on some basic procedures has been included.

TANNER CRAB

"A Few Studies on the Ripeness of Eggs of Zuwaigani, Chinoecetes opilio," by Katsuchiyo Ito, translation from 'Bull. Japan. Reg. Fish. Res. Lab.,' Vol. 11, pp. 65-76, 1963, and "Fisheries Biology of the Tanner Crab. II-On the Frequency of Molting," by Tohshi Kon, Masakazu Niwa and Fumio Yamakaea, translated from 'Bull. Japan. Soc. of Sci., Fish.' Vol. 34, No. 2, pp. 138-142, 1968.

Translation Series Nos. 1117 and 1129, respectively, Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B., 1968.

TUNA

"Age and Growth of the Yellowfin Tuna (Thunnus albacares) in the Pointe-Noire and Dakar Regions (West Africa)," by J.C. Le Guen and C. Champagnat, Doc. No. 431 S.R., Office de la Recherche Scientifique et Technique Outre-Mer, Centre de Pointe-Noire, Oceanographic, 1968, 22 pp., translated by John P. Wise. Translation No. 19, Tropical Atlantic Biological Lab., BCF, Miami, Fla., 1969.

UNDERWATER ACOUSTICS

"Seasonal and Diurnal Occurrences of Fish Sounds in a Small Florida Bay," by Charles M. Breder Jr., Bulletin of the American Museum of Natural History, New York, 1968, Vol. 138, Art. 6, pp., 325-378, illus., $2.

With the development of simple and easily handled equipment, suitable for use by other than electronic specialists, studies involving underwater acoustical activity have advanced rapidly. Very little work on soni ecology and its relation to the life history and behavior of any species has been reported. The primary purpose of this study was to provide preliminary background data on acoustic activities of certain shore fishes.

WHALES

"Sperm Whales of the Southeast Pacific," by Robert Clarke, Anelio Aguayo L., and Obla Paliza, Hvalradets Skrifter, No. 51, Det Norske Videnskaps-Adademii Oslo, 1968, 80 pp., illus.

In a stock exploited by whaling, the size distribution of the catch is not apt to be of value as a racial characteristic, but external characters and dental formulae may give useful information on stock limits. This paper describes the Southeast Pacific sperm whale stock in terms of the variation of these characters, and attempts to compare this variation with published results from other stocks where appreciable numbers of whales have been examined.

WORLD FISHERIES

"Yearbook of Fishery Statistics--Catches and Landings, 1967," Vol. 24, Food and Agriculture Organization of the United Nations, $6. Sold by the National Agency for International Publications, 317 E. 34th St., New York, N.Y. 10016.

The Yearbook tables cover the catches or landings of all fish, crustaceans, molluscs and other aquatic animals, residues and plants, made by commercial and subsistence fishermen in freshwater and marine areas. Statistics are given by continents, countries, regions, fishing areas, and species.

--Barbara Lundy

INTERNATIONAL

Government Experts Report on Expanded Nordic Economic Cooperation

Fisheries will play an important role in any expanded Nordic economic cooperation in the future. Long-term discussions underway revolve around the question whether expanded Nordic cooperation is preferable to the possibility of joining the European Common Market. A summary of the proposal for increased cooperation made by Nordic government representatives follows.

The cornerstone in the plan is establishment of a Nordic customs union over a 5-year period. Then, the 4 countries would have a common external tariff system and free trade within the Nordic area. A preliminary review indicates that, in general, the proposed Common Nordic duties for fish products would represent increases over existing Danish duties.

Price Stabilization

The main fisheries proposal, introduced by Norway, calls for a system to stabilize first-hand prices for fish at Nordic landing ports. The 4 countries either would establish a market-regulating agency, or expand the existing marketing apparatus to make the market-regulating system work.

Each national regulating agency would have these objectives: (1) to set minimum prices on fish landed, (2) limit supplies of fish to the market for human consumption when necessary to maintain established minimum prices, (3) to regulate supplies with regard to each port's capacity to secure best possible utilization of landings, and (4) to regulate, and perhaps stop fishery when necessary to prevent market collapse. Operations of the national market-regulating agencies would be financed by a landing fee, collected by each agency, not over 3% of value.

Crisis Funds

If market conditions deteriorate and the national agencies prove inadequate, 2 common Nordic crisis funds might be used: One would be established for herring and mackerel market, the other for cod, haddock, coalfish, pollock, and plaice. Each fund would be administered by a special inter-Nordic coordinating agency; the latter would also consult with the national agencies to set minimum prices. Separate funds and coordinating agencies are required for these 2 catgeories of fish. This is because herring and mackerel are, to some extent, sold as food for humans--but mostly go into meal and oil production. The price system must accommodate these 2 uses.

The crisis funds would be established by annual appropriations from Nordic countries of about US$4.3 million, until the two-fund total was about US$21.4 million. If the marketing situation deteriorated beyond the control of the national agencies, money could be allocated from the crisis funds for price-support payments--or to buy and store surplus fish to regulate market. Provision would be made to replenish crisis funds.

The Norwegian proposal does not cover fully the method of setting minimum prices. It proposes merely that prices for fish in landing ports be set in relation to one another, according to differences in freight rates to the major markets for Nordic fish.

Herring & Mackerel

For herring and mackerel, coordinated minimum prices would be set to enable full exploitation of the human food market. Fish that could not be sold at or above minimum price would be withdrawn from market. These would be sold for animal feeding, or to produce meal and oil. Most of surplus would go for meal and oil; a Nordic-wide guaranteed price would be set.

The guaranteed price would be maintained by the national agencies through regulation or stoppage of the fishery. If these were inadequate, support payments could be made from crisis fund for these species.

5 Food Fish Involved

For the 5 food fish involved, coordinated minimum prices would also be set (as outlined above) when these 5 are sold fresh for

human consumption--or for freezing, canning, or salting. A minimum price for dried fish might be set in North Norway, the only Nordic area where it is produced in significant quantities. Whenever necessary to maintain minimum prices, food fish that could not be sold to people would be withdrawn from the market and sold for animal feeding or industrial use. The national agencies would regulate the fisheries.

When marketing difficulties were severe the food-fish crisis fund could be used to guarantee prices of fish purchased for storage to regulate market. It could also extend guarantees for production of certain quantities of processed fish, and possibly undertake to buy up stocks to assure continued production. If continuation of these measures were no longer justified, the national agencies would further curtail the fisheries.

Difficulties Expected

Implementation of price stabilization would make possible direct landings of fish in the 4 countries without discrimination. It is proposed further that funds would be made available for structural improvements. The plan assumes various restrictions on fishery trade would be removed when the customs union begins, although considerable difficulties are anticipated in the liberalization process.

The report also urges further cooperation in: (1) exports to third countries, including desirability of Nordic-wide minimum export prices for certain fish products, (2) commercial policy, especially with regard to a common Nordic stand on European Communities actions, (3) aid to developing countries, and (4) marine research, product development, and marketing. (U.S. Embassy, Copenhagen, Jan. 31, 1969.)

Prospects for European Industrial Fisheries

The 1969 Norwegian winter herring catch was predicted to be about 370,000 metric tons, assuming normal weather conditions. Herring arrived off Norway in mid-Feb. Bad weather held last year's catch to only 26,000 tons; 370,000 to 560,000 tons had been predicted. Catches of this stock fluctuate greatly from year to year. Weak year-classes in 1965, 1966, and 1967 were expected to hold catches down in 1968-70.

Summer Herring

The Icelandic summer herring fishery takes place after winter herring finish spawning and leave the Norwegian coast. Although the 1968 summer season was not successful, a more normal catch is expected this year.

Capelin

The capelin fishery off North Norway is subject to wide fluctuations--the 1968 catch exceeded 450,000 tons--but scientists will say only that there is hope for a reasonably good fishery in 1969.

North Sea Herring

Earlier, it was predicted that total North Sea herring catches by all countries would stabilize at 650,000 to 700,000 tons annually. With careful management the catch could possibly increase somewhat. However, reduced abundance of the aging 1963 year-class and lesser strength year-classes since 1963 indicate this stock will decline. Norway's share in 1969 is expected to be about 300,000 tons.

Mackerel

A large quantity of young mackerel entered the North Sea mackerel fishery in 1967. At the same time, the harvest of older mackerel had begun to diminish. Because it is uncertain whether this stock is overfished, results of the 1969 season will be watched with interest. Biologists state for management purposes that the catch should not exceed 450,000 tons; it was 868,000 tons in 1967 and 770,000 tons in 1968. (U.S. Embassy, Copenhagen, Feb. 11, 1969.)

1968 World Fish Meal Production Was 6% Over 1967

Total fish meal production in International Association of Fish Meal Manufacturers (IAFMM) countries increased 6% in 1968 to 3.8 million metric tons. Substantial production increases were reported in Canada, Chile, Denmark, U.K., Peru, and S. & S.W. Africa. W. Germany, Norway, and Iceland

lowered output in 1968, especially Iceland, where production dropped 53% from 1967.

	1/1968	1/1967
	(Metric Tons)	
Belgium	4,560	3,780
Canada	122,498	89,434
Chile	187,243	130,866
Denmark	222,770	149,261
France	13,200	13,200
West Germany	69,697	77,065
Sweden	8,029	7,824
United Kingdom	88,717	80,487
United States	190,725	167,154
Angola	3/ 37,457	44,763
Iceland	53,242	112,849
Norway	401,932	491,562
Peru	1,922,020	1,815,983
So. Africa (including S.-W. Africa)	471,142	351,928
Spain	53,000	43,600
Morocco	2/	35,000
Total	3,846,232	3,614,756

1/Revised.
2/Data not available.
3/Jan.-Oct. only.
Note: Japan does not report fish meal production to IAFMM on a monthly basis at present. Estimate for 1968 of fish meal and other animal meal (mostly fish meal), is 440,000 metric tons; 387,000 metric tons in 1967. (Foreign Agricultural Service, Tokyo, Oct. 1968.)
Source: IAFMM.

FEO Fish Meal Exports Rose 20% in 1968

In 1968, over 3.1 million metric tons of fish meal were exported by members of the Fishmeal Exporters Organization (FEO), almost 20% more than in 1967. An increase of 500,000 tons from Peru and about 70,000 from S. and S.W. Africa more than made up for Iceland's tremendous decline. Entering 1969, stocks were lower for every FEO country except Chile. In 1968, FEO countries produced 82% of total world fish meal production (excluding Japan and USSR).

Country	1968	1967
	(Metric Tons)	
Angola	1/	37,810
Chile	167,191	111,199
Iceland	60,632	135,008
Norway	432,048	487,516
Peru	2,083,205	1,560,900
S. and S.W. Africa	353,407	285,951
Total	3,096,483	2,618,384

1/Data not available; 35,500 tons through Oct. 1968.
Source: Fishmeal Exporters Organization.

Marine Oil Production

World marine-oil production in 1969 is expected to increase slightly from 1968. This estimate reflects anticipation of further expansion in fish oil output and a possible increase in baleen whale oil. Sperm whale oil production probably will remain around 1968's volume.

It is difficult to predict world production of fish body and liver oils because of these developments: (1) recent reports of reduced oil yields in Peruvian anchovies, together with a 4-week "Veda," or stoppage, that began Feb. 1, and a reduced catch; (2) probable improvement from the poor 1968 herring-oil output in Norway and Iceland; (3) sharp increases in 1968 output in Chile, Denmark, and S. & S.W. Africa, possibly continuing at a lesser rate; and (4) large stocks in some producing countries and relatively low prices may tend to discourage fishing.

Estimated World Marine Oil Production

	1969	1968	1960-64
	(1,000 Short Tons)		
Marine Oils:			
Whale	105	100	356
Sperm whale	150	150	137
Fish (including liver)	1,150	1,125	687
Total	1,405	1,375	1,180

Scandinavia Important Factor

Assuming that Peru's output declined by 15%, and that no significant increases come from other countries, then any significant change in output must rest on likelihood and extent of a recovery in output from Norway and Iceland. Since a 10% improvement from their estimated combined 1968 output could more than offset the expected decline in Peru, any recovery beyond that would increase world output. Such an improvement is expected. And, with possible increases by minor producers, would result in some increase, possibly 2-3% above last year. In case the estimated increase does not materialize, stocks are sufficiently large to cover near-term requirements.

Whale Oil

Breaking the downtrend that has persisted since 1961, production of baleen whale oil this year is expected to increase by about 5% from 1968's estimated low of 100,000 short tons. Any increase will be largely contingent on

fulfilling the Antarctic quota of 3,200 blue-whale units (BWU) at an average outturn of 21 tons per BWU. This year's Antarctic quota remained unchanged from the year before, when the catch was only 2,801 BWU. This yielded an average of 21.1 tons per BWU. Partly offsetting the expected increase in Antarctic production, pelagic output from the North Pacific may decline somewhat due to the International Whaling Commission's decision to reduce the catch of fin whales. Japan, the Soviet Union, and Norway now provide about 90% of the world output, largely from Antarctic catch.

Sperm whale oil production which is subject to the Antarctic quota agreement is not expected to differ significantly this year from 1968. However, it is expected to be 10% above the 1960-64 average. Soviet output has sharply expanded in recent years; it is now over three-fifths of the world total. Numerous small producers have either cut back or ceased operations. Most expansion in recent years has been in North Pacific pelagic catch, while output from shore stations outside the Antarctic has continued to decrease. Production from other major areas, including Antarctic pelagic output, remains at about 1960-64 average. ("World Agricultural Production and Trade," Jan. 1969.)

Thermal Pollution Endangers Fish

Trout, salmon, and other fresh-water fish are increasingly threatened by hot effluents from industrial plants. Danger of "thermal pollution" is greatest in rivers and streams where electric and other power plants discharge water heated to between 43°-61° F. This often is deadly to fish, their eggs, and the organisms on which they feed. Thermonuclear plants generate very high temperatures, making them a particular threat.

Dangers of Heat Change

Fish, as cold-blooded creatures, are extremely sensitive to heat changes, particularly to sudden changes. During spawning, a temperature increase of only 2 to 3 degrees can be fatal. Increased temperatures also can be indirectly harmful, weakening the resistance of fish to disease, reducing the essential oxygen in the water, or augmenting toxic effects of organic pollutants.

EIFAC Recommendations

The problem has been cited by the European Inland Fisheries Advisory Commission (EIFAC) of the Food and Agriculture Organization. EIFAC seeks to promote inland fisheries in Europe. The 21-nation Commission is drafting international water-quality criteria to combat pollution affecting freshwater fish.

Benefits from Heated Water

EIFAC points out, however, that with certain species, such as carp, controlled hot effluents can be beneficial. They may provide warmth for better spawning and feeding conditions and aid in maturation of eggs. Roach, a coarse fish now popular with European anglers, actually thrives in U.K. streams where hot effluents remain tolerable.

Carp Bred in Heated Water

In Poland, where common carp usually do not propagate in natural waters, the report states, the species has reproduced successfully in artificially heated Lake Lichen. Carp's tendency to congregate in heated effluent outfalls has led to Soviet attempts to breed them in floating cages in heated water reservoirs.

Thermal Pollution Endangers Salmon

In North America, thermal pollution is considered a severe challenge to the great salmon runs of the Columbia River. A study of the biological effects of thermal pollution there is under way. The trout and salmon resources of northern streams in other countries may be similarly endangered. The work of EIFAC supplements that in the U.S., where the latest report on water-quality criteria, by the National Technical Advisory Committee, emphasizes preserving fish stocks from increased heat loads. (FAO News.)

Japan & Canada Conduct Joint Whaling Venture

The Atlantic Whaling Co., Saint George's, Nfld., was formed in July 1967 by Taiyo Fishing Co., Japan, and Fishery Product, Ltd., Canada. It has been performing successfully.

The company is capitalized at US$100,000; Taiyo holds 49.5% interest. It catches and processes fin whales, and operates one chartered whaling vessel, 'Fumi Maru No. 15' (499 gross tons), out of the shore plant at Williamsport.

Catch & Production

In 1967, Fumi Maru caught 262 fin whales, exceeding an assigned quota of 250; in 1968, it fulfilled the reduced quota of 219.

The whales are processed at the shore plant. The plant can process 4 whales and freeze 35 tons of meat a day. The whale meat, exported primarily to Great Britain, also goes to other European countries, including West Germany and the Netherlands. A limited quantity is marketed locally. Export price for frozen whale meat is around $253 a ton. ("Suisan Keizai Shimbun," Jan. 30, 1969.)

Japan & USSR Hold Crab-Fishing Conference

A Japanese-Soviet crab conference began in Moscow on Feb. 6. The USSR called the conference to discuss Japanese crab fishing in connection with the Soviet Continental Shelf declaration announced Feb. 1968.

Again, as in the 1968 Japan-USSR fishery negotiation in Moscow, the Soviets may attempt to ban Japanese crab fishing in the Northwest Pacific, on the basis of the Continental Shelf concept.

The Japanese delegation was led by Iwao Fujita, Vice-President, Japan Fishery Society. Minister of Fisheries Alexander Ishkov headed the Soviet delegation. ("Suisancho Nippo," Jan. 30, 1969.)

Fear Depletion of North Sea Fishery Resources

Two-hundred scientists from 14 countries have warned that if drastic antipollution measures are not taken soon, the entire North Sea flora and fauna will be threatened. They fear that North Sea fishery resources will be destroyed in the near future, according to the official organ of the Soviet Ministry of Fisheries. The report also stated that the scientists have appealed to governments and international organizations to intensify research aimed at solving the problem of ocean pollution--especially North Sea.

North Sea

The report pointed to the highly developed industries and high population density of the North Sea coastal nations. Their rivers discharge huge amounts of wastes into the sea and into the extremely shallow coastal waters, where insignificant tidal phenomena prevent self-purification of the waters. ("Rybnoe Khoziaistvo," Nov. 1968.)

Without specifically mentioning pollution, the Minister of Agriculture and Fisheries of The Netherlands has said that the North Sea virtually could be written off as a fishing ground. He noted that over the past 3 years herring catches have dropped 50%. The Netherlands Ministry is considering financial assistance for fishing enterprises forced to look for new grounds outside the North Sea because of this situation. (U.S. Embassy, The Hague, Jan. 31, 1969.)

FOREIGN

CANADA

PLANS FISHERMEN'S SCHOOL

A first-of-its-kind training school for fresh-water fishermen is being built at Hnausa, Manitoba, west shore Lake Winnipeg. Already it is attracting considerable interest from the fishing industry across Canada.

The school is based on research findings indicating commercial fishing in Manitoba is changing rapidly; also, that it will change further when the proposed fish-marketing board paves the way for orderly marketing, more stabilized prices, better quality control, and more efficient operation.

A comprehensive training program was needed because existing skills and knowledge in the fresh-water industry are below standards necessary to attain maximum benefits from a change in marketing. When the new school opens this year, training will be tied in with real situations, using practical methods, on the site of fresh-water fishing.

Fish-Demonstration Station

The school is a fish-demonstration station to cover all phases of production--from actual setting and lifting of nets through final product. Classroom and practical instruction courses will be aimed at imparting management skills and techniques necessary to operate a station. The students will be fishermen with some knowledge and perhaps limited experience of fishing. They will be exposed to new types of fishing gear and advanced fishing methods in classroom and in the water.

The first class of 25 has been enrolled for a course beginning in March 1969, when the school and its facilities are scheduled to be completed. The school has adequate area to expand. ('Fisheries of Canada,' Jan. 1969.)

* * *

CONFERENCE ON QUEEN CRAB SCHEDULED

A 2-day conference on the queen crab fishery was held March 4-5 in Fredericton, N.B., Canada. Minister of Fisheries Jack Davis and New Brunswick Premier Louis J. Robichaud were guest speakers.

The conference was sponsored by the Federal Department of Fisheries in cooperation with the Maritime Provinces, Quebec, and Newfoundland. It brought together specialists and industry personnel for discussions about the development and management of the new fishery. Papers were presented on catching, processing, and marketing.

Fishery Booms

The phenomenal growth of the queen crab fishery on the Atlantic Coast was a highlight of Canada's fisheries in 1968. In the past 4 years, the catch has grown from nothing to 10 million pounds in 1968. Landings are expected to double in 1969.

The queen crab fishery has provided a new source of revenue to many fishermen and plant workers. It is a valuable export commodity. (Canadian Department of Fisheries, Jan. 27, 1969.)

* * *

QUEBEC DOES NOT RENEW FISHING SUBSIDIES

The Province of Quebec has not reinstated the ordinary fishing subsidies it dropped in fall 1968, when Federal fishing subsidies began, even though the government abandoned its fishing-subsidy program in the meantime. A Quebec official hopes that something can be worked out between Canada and the U.S. to alleviate the plight of Quebec fishermen. He adds, however, that no subsidy plans were under consideration at Quebec. (U.S. Consul, Quebec, Feb. 20, 1969.)

* * *

'GREENLAND TURBOT' PROMOTION BEGINS

The Dept. of Fisheries and the Dept. of Trade and Commerce plan to exhibit 'Greenland turbot' at the Pacific Fine Foods Fair in Los Angeles, June 1969. This is a move to promote acceptance as 'Greenland turbot' of the fish previously marketed as 'Greenland halibut.' Late last year the U.S. banned sales of this fish as halibut. (U.S. Consul, St. John's, Feb. 14, 1969.)

EUROPE

Norway

LANDINGS DECLINED IN 1968

In 1968, Norwegian fishermen landed 2.6 million metric tons of fish--15% less than in 1967. Chief cause of the decline was a 42% drop in the herring catch and an 11% drop in mackerel landings. Fortunately, 1968 was a good year for capelin, which are used for fish meal. This averted a totally disastrous year. ('Fiskets Gang,' Dec. 1968, No. 52.)

	1/1968		2/1967		1966		1965	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	1,000 Metric Tons	Million Kr.	1,000 Metric Tons	Million Kr.	1,000 Metric Tons	Million Kr.	1,000 Metric Tons	Million Kr.
Mackerel	770	177	868	202	484	183	158	74
Herring	702	166	1,215	286	1,186	404	1,079	355
Capelin	522	50	403	49	380	68	217	31
Cod	238	303	200	260	197	262	188	242
Saithe	79	51	128	81	143	96	131	85
Norway pout	66	8	14	2	25	6	61	11
Haddock	48	55	40	45	63	72	50	60
Dogfish	20	14	16	13	16	14	19	14
Greenland turbot	19	18	15	14	14	14	15	14
Cusk	17	18	17	20	15	17	20	22
Other	91	162	113	212	131	200	141	199
Total	2,572	1,022	3,029	1,184	2,654	1,336	2,079	1,107

1/Preliminary.
2/Revised
Note: 7.135 Kr.=US$1.

* * *

STOCKFISH MARKETING PROSPECTS ARE GOOD

Commercial sales of Norwegian stockfish have shrunk drastically since spring 1967, and nothing indicates early improvement in marketing prospects. Some North Norwegian communities depend almost entirely on stockfish production, so concern has been voiced repeatedly by the press, Parliament, government, and fishery organizations.

Small Sales, Large Inventories

The reduced sales are due almost exclusively to the drop in demand from Nigeria, the number one market for so-called "African quality" stockfish. Commercial deliveries, mostly to the Province of Biafra, decreased from more than 17,000 metric tons--70% of all Norwegian stockfish exports--before the civil war, to only a few hundred tons in 1968. Sales of prime quality stockfish were also somewhat sluggish during 1968, presumably because buyers abroad anticipated price reductions due to increasing Norwegian inventories. Despite substantial state purchases, stockfish inventories in mid-Feb. 1968 were about 12,000 tons (excluding 6,700 tons of state-purchased fish distributed to relief agencies), or one-half of a normal year's production. Judging by officially projected production for 1969 and current marketing prospects for both prime and "African" quality stockfish, inventories could increase to about 18,000 tons during 1969 unless some is purchased by government and/or relief agencies.

Government Assistance

To maintain a minimum production of stockfish, the Norwegian Government has effected measures, including interest-free loans and state guarantees to producers and exporters. These measures claimed nearly US$28 million in state funds in 1968 alone, including $9.5 million for state purchases of about 14,000 tons of "African quality" stockfish. The rationale for them is to support North Norwegian fishing communities heavily dependent on stockfish production and to ensure output of prime quality stockfish, which commands high prices in such European markets as Italy, Sweden, and Finland.

Year	Production	Exports	Year-End Stocks
	(Metric Tons)		
1968	21,600	16,700	19,000
1967	23,000	18,900	16,500
1966	25,200	26,000	14,000

Norway (Contd.):

Commercial exports were less than 10,000 tons in 1968 since 7,000 tons of the total were state-purchased fish distributed abroad through the World Food Program, the Red Cross, and the Norwegian Church's Relief Organization.

Prospects

Norway will produce an estimated 15,000 to 16,000 tons of stockfish in 1969. Nigeria cannot be expected to resume stockfish purchases in the foreseeable future, and development of new markets in Africa cannot be anticipated in the short term. Therefore it is reasonable to assume that commercial exports of Norwegian stockfish in 1969 will remain at the 1968 level of about 10,000 tons. This means that stockfish inventories will swell to about 18,000 tons at the end of the year if no measures are taken to dispose of surplus production. No such plans have been announced by the government, but state guarantees have been extended for a maximum of about 9,000 tons of the 1969 "African quality" stockfish production. (U.S. Embassy, Oslo, Feb. 21, 1969.)

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MIXED REACTION TO U.K. TARIFF ON FROZEN FISH

Findus, one of Norway's major fillet exporters, reports adverse effects on its frozen fillets exports to the U.K. since Britain imposed a 10% import duty late last year. Frionor, another firm, claims it is too early to predict ultimate effects of new duty on its 1969 exports to Britain.

Before the 1967 pound devaluation Britain was Findus' largest market, taking some 34% of its total exports. After devaluation, fillet block exports dropped about 40%, while Findus' volume of consumer-packed fish continued at the same level even at considerably reduced prices. Before the 10% was introduced, Findus had succeeded in restoring sales to the pre-devaluation level. Under the new duty, Findus' customers can cover their requirements from other suppliers, mostly British, at prices with which Norway is unable to compete. Exports may be reduced even further if the 10% duty is maintained.

To Hold U.K. Market

Frionor says it has supplied only quality products at high prices. It believes Britain, a traditional market, will continue to require Norwegian fish. The Norwegian fishing industry will not withdraw, but will take necessary measures to retain this important market.

Although British fishermen may benefit competitively to some extent from the new duty, it may be that British demand for Norwegian products will be such that adjustments to increase prices will be made. However, Icelandic products will become more competitive in the British market. Iceland has not been a member of EFTA, and so has not benefited in the past from the reduced duty under EFTA arrangements. (U.S. Embassy, Copenhagen, Feb. 20, 1969.)

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BARENTS SEA HAS FISH CONSERVATION PROBLEM

Rapidly diminishing resources of fish, particularly cod and related species, in the Northeast Atlantic is one big unsolved problem, says Hallstein Rasmussen, Deputy Director, Norwegian Fisheries Directorate. Fishermen seem unable to see beyond the present ample supplies of fish although there are some marketing problems abroad, notably for stockfish. Scientific predictions of drastic catch reductions in the immediate future seem to make no impression on fishermen, who scooped up large quantities of fish just outside the coasts of Troms and Finnmark during most of 1968. This apparent paradox of good fishing and small fish resources is explained by the fact that capelin, a major food for Barents Sea cod and related species, stayed just off the coasts of Troms and Finnmark for unusually long periods in 1968. Catches of capelin for reduction reached an all-time record in 1968--over 0.5 million metric ton.

Fish Scarce in Barents Sea

In the Barents Sea proper, outside the Norwegian fishery border, fishing was very poor. The few trawlers, mostly Russian, kept as close as possible to Norwegian waters to catch fish. If and when capelin leaves Norwegian waters (as it often does), there will not be much other fish left either.

Norway (Contd.):

Resource Management Needed

Conservation and replenishment of Northeast Atlantic fish resources depend on much more comprehensive measures than those considered so far. One plan would have nations fishing in the Barents Sea reduce their catch from the current 400,000 metric tons annually to 250,000 tons. Even the latter figure is too high in the opinion of many Norwegian marine biologists. The best solution, Rasmussen says, would be a complete ban on trawling, at least in areas known as feeding grounds for fish before they reach maturity. There should be no reason to ban longlines and handlines because they are much more selective than trawls. (U.S. Embassy, Oslo, Jan. 24, 1969.)

* * *

NORWAY FORBIDS DANISH TROUT-EGG IMPORTS

Norway and Sweden have forbidden the import of trout eggs from Denmark to prevent introduction of virus diseases, presumably infectious pancreatic necrosis (IPN). IPN appeared on some Danish trout farms during 1968.

Effects of Ban in Norway

A Norwegian sports fishermen's association at Lillehammer was forced to cancel an order for 300,000 Danish eggs. Other clubs and some trout farms will also be affected. Substantially increased trout egg output in Norway is planned to relieve the shortage. (U.S. Embassy, Copenhagen, Feb. 14, 1969.)

* * *

EXPLORATORY FISHING IN GULF OF MAINE

The Norwegian Institute for Marine Research has chartered the distant-water longliner 'Pero' for a 2-month exploratory cruise between Cape Race, Newfoundland, and Cape Cod. The investigations were recommended following failure of the cod fisheries off West Greenland last year. Funds totaling US$68,000 are available for the work.

New Fishing Grounds

Pero sailed from Norway on Jan. 25, 1969, with a skipper who has fished porbeagle on these grounds. They are largely unknown to Norwegian cod fishermen, who have not fished at such great distances from their home ports before. Later, the exploratory fishing will be extended to grounds off West Greenland. (U.S. Embassy, Copenhagen, Feb. 14, 1969.)

Denmark

GREENLAND'S 1968 SALMON CATCH IS WELL BELOW 1967's

The 1968 catch of salmon in Greenland waters will probably total about 1,200 metric tons, or about 25 percent below the near-record 1967 catch of 1,588 tons. The 1968 inshore catch was less than half 1967's. It is presumed the presence of colder water was responsible. The catch of the offshore fishery more than doubled. This resulted from the larger number of vessels fishing and the excellent weather through most of the season.

Price Higher

The price paid for Greenland salmon was higher at the beginning of the 1968 season than in the previous year. It increased as the season progressed. Because fishing was lucrative this year, offshore fishing effort can be expected to continue increasing.

The joint tagging program of the International Council for the Exploration of the Sea and the International Commission for the Northwest Atlantic Fisheries was continued--but few fish were tagged. Northumberland T-nets were tested again, with little success. This may have been due to ice and hydrologic conditions obstructing fish from coming inshore. The low availability of fish in these waters is also indicated by poor results of inshore fishing by Greenlanders. (U.S. Embassy, Copenhagen, Feb. 4, 1969.)

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Denmark (Contd.):

FAROESE FISHERMEN'S STRIKE SETTLED

A strike by Faroese fishermen was called off Feb. 19, 1969, when they accepted a compromise proposed by a government mediator. The fishermen had wanted an increase in minimum monthly wage to US$267 and a reduction from 27 to 21 in long-line vessel crews. This would have increased each crew member's share of the catch. The full demands of the fishermen were not met, but the Faroese legislature has appropriated nearly US$1 million for minimum wage increases and for additional price support.

Last Strike in 1954

The strike was the first in the Faroe Islands since 1954. It began in early Dec. 1968 when the fishermen's association refused to approve the sailing of vessels to the main Faroese fishing grounds off Greenland and Newfoundland. The strike, formally declared at the end of Jan. 1969, included most of the Faroese fishing fleet. (U.S. Embassy, Copenhagen, Feb. 20, 1969.)

* * *

SMALL HADDOCK POSE PROBLEM

Industrial fishermen from the North Sea port of Esbjerg found an abundance of small haddock when fishing resumed after the new year. Fifty percent or more of most catches were haddock smaller than the minimum size limit of 270 millimeters (10.6 inches). The Danish Fisheries Inspection Service, acting immediately, fined 50 to 60 Esbjerg skippers amounts up to US$800. It was thought that industrial fishing in Esbjerg might have to cease entirely for a time. In late January 1968, incidence of illegal haddock in the landings had declined. Some cutters had located places where "pure" catches of herring could be taken.

Fishermen Ask Relaxation of Regulations

Fishermen's association representatives met with the Ministry of Fisheries to ask a relaxation of regulations. After the meeting the Minister of Fisheries said that no basic change could be made because the regulations had been set in cooperation with other members of the North East Atlantic Fisheries Commission. He promised, however, that skippers would be treated as gently as possible under the circumstances.

Potential Market for Haddock

Although cod are highly esteemed as food for people, there is very little demand for haddock. Haddock were popular before 1930, but "went out of style" as a food fish after a period of scarcity; the market has never come back. Many haddock now abundant in the North Sea will exceed the minimum size in a few months, so there will be a possibility of landing them as food fish. Although fish exporters would buy more haddock in auctions, fishermen consider them more difficult to clean on board than cod and plaice, and may not believe the extra work worthwhile.

Landings in Previous Years

Total Danish haddock landings in 1967 were 24,000 metric tons; only 6,400 tons were used for food fish, the remainder for industrial use. Total 1966 landings were 47,000 tons; 8,000 tons were sold for human consumption. Haddock exports were 4,800 tons in 1967 and 4,700 tons in 1966; most was shipped fresh to West Germany, Sweden, and the U.K. (U.S. Embassy, Copenhagen, Jan. 21, 1969.)

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FISH MEAL, OIL, AND SOLUBLES PRODUCTION, 1967-68

	1968	1967
	..(Metric Tons)..	
Fish Meal.....	219,079	145,359
Fish Oil.....	70,198	61,197
Fish Solubles ...	25,892	30,865

(U.S. Embassy, Copenhagen, Feb. 26, 1969; Denmark's Statistical Dept. 1967 totals.)

Sweden

THE SHRIMP TRADE

Sweden's West Coast Fishermen's Association recently asked the government to restrict shrimp imports, but in late Jan. the government decided not to act. Swedish fishermen landed 1,251 metric tons of cooked

Sweden (Contd.):

shrimp in 1968, compared with 1,154 metric tons in 1967. In addition, a small quantity of raw shrimp has been delivered to canneries each year. Imports of shrimp in 1968 are estimated at more than 2,000 metric tons.

Swedish Shrimp vs. Imported

Almost all imported frozen shrimp sold in Sweden has been described as "Canadian shrimp." In Goteborg, some stores sell only Swedish shrimp, and some sell both Swedish, Canadian, and Norwegian shrimp. One retailer, refusing to sell frozen Canadian shrimp, has appealed to his colleagues to follow his example. "Support Swedish fishermen--buy Swedish shrimp" is the text on a streamer in the store window. Imported shrimp prices are from 20% to 30% lower than domestic. Swedish shrimp is generally considered to be higher quality than imported shrimp.

U.S. Exports

The U.S. has developed a lucrative shrimp trade with Sweden. In 1968, the U.S. exported 487,181 lbs. of fresh, chilled, unpackaged shrimp valued at $474,147; 415,269 lbs. of fresh, chilled, packaged shrimp valued at $303,079; and 817,068 lbs. of frozen shrimp worth $540,849. (U.S. Consul, Goteberg, Feb. 6, 1969.)

United Kingdom

WHITE FISH AUTHORITY
RAISES INTEREST RATES

The British White Fish Authority has announced new interest rates on loans made from Dec. 21, 1968.

On loans for fishing vessels, new engines, nets and gear:

Less than 5 years, $8\frac{3}{8}\%$--up $\frac{1}{8}\%$.

More than 5, but less than 10 years, $8\frac{1}{2}\%$--up $\frac{1}{4}\%$.

More than 10, but less than 15 years, $8\frac{1}{2}\%$--up $\frac{1}{4}\%$.

More than 15, but less than 20 years, $8\frac{5}{8}\%$--up $\frac{1}{8}\%$.

On loans for processing plants:

Less than 5 years, 9%--up $\frac{3}{8}\%$.

More than 5, but not more than 20 years, 9%--up $\frac{1}{4}\%$.

Rates on loans made before Dec. 21, 1968, are unchanged. ("Fish Trades Gazette," Jan. 11, 1969.)

West Germany

A REVIEW OF
WEST GERMAN OCEANOGRAPHY

From 1962-1968, the German Research Association (DFG) provided almost US$1.25 million annually to supplement government funds for oceanographic research. This support was greatly responsible for progress German scientists have made trying to catch up to France and Britain--and to regain position of eminence once held by German oceanographers.

The support of DFG, the Federal Government, and 4 coastal states resulted in considerable expansion of oceanographic efforts. During the 5-year period beginning in 1962, the number of scientists and technicians increased from 253 to 527. A fishery research vessel, 'Walter Herwig' (1963), research vessel 'Meteor' (1964), Bundeswehr research vessel 'Planet' (1967), and research cutters 'Alkor' and 'Friedrich Heinicke' were launched to supplement the work of the 2 then-existing ocean-going research vessels, 'Gauss' and 'Anton Dohrn.'

Growth Plans

Germany's annual marine research budget is now only about one-third the French and British budgets. Despite this, Science Minister Stoltenberg included marine research as a special area of his ministry and established the German Commission for Oceanography.

The Science Ministry will further consolidate earlier DFG-supported work through long-term planning and financing. Present plans call for 54 more scientists, about 100

West Germany (Contd.):

more technicians, and construction of an 800-GRT research vessel and 3 research cutters. The research vessel would be used in the Baltic and North Seas and North Atlantic. The two cutters would replace older vessels.

European Pooling of Effort

Programs are also under consideration to build artificial islands and place measuring buoys in the North Sea and Baltic Sea. Construction of a major laboratory, with wave-simulation tanks and rotation pools for hydrodynamic experiments, faces financial problems.

DFG realizes that requirements for oceanographic instruments would not be great enough to encourage national industries in Europe to conduct research and development necessary to develop technology. DFG recommends a pooling of effort by European industries to develop and manufacture complex oceanographic measuring equipment. (U.S. Embassy, Bonn, Jan. 28, 1969.)

Netherlands

FISHERIES MINISTER NOTES
DECLINE OF NORTH SEA FISHING

The North Sea can virtually be written off as an important fishing ground, said Netherlands' Minister of Agriculture and Fisheries, P.J. Lardinois, in discussing his 1969 budget on Jan. 29, 1969. In the last three years, the Minister noted, herring catches had been halved.

He is now considering what financial assistance might be given to sound fishing enterprises forced to look for new fishing grounds outside the North Sea. (U.S. Embassy, Hague, Jan. 31, 1969.)

Iceland

DECLINE IN HERRING
DRASTICALLY REDUCES 1968 CATCH

Iceland's 1968 fishing catch dropped to 554,000 metric tons, a 40% decline from 1967 and 55% from 1966, according to preliminary data. Most of the loss is attributable to the drastic decline in herring catches. These dropped from 895,600 tons in 1966 to 207,000 tons in 1968. (U.S. Embassy, Reykjavik, Jan. 16, 1969.)

USSR

COUNCIL OF MINISTERS PRODS
MINISTRY OF FISHERIES

The Soviet Council of Ministers has adopted a resolution titled "Additional measures to improve the efficiency of the fishing fleet and improve the quality and expand the selection of fishery products." The resolution notes that implementation of earlier council decisions to develop the fishing industry has strengthened its technical and supply capacity, increased the fish catches, and improved the quality and variety of fishery products somewhat.

Failures of Ministry of Fisheries Cited

At the same time, because of weak leadership by the Ministry of Fisheries, the powerful fishing fleet is not being used efficiently. Marketed products do not meet the consumer's demand for variety and quality. Steps to remove these shortcomings are not being taken. Output of edible fishery products lags considerably behind the increase in catch. This has a negative effect on the economics of fishery enterprises. Consumer demand for live and frozen fish, filleted fish, fresh-salted herring, and cured, smoked, and delicatessen products is not being fully satisfied. There is not sufficient volume in output of fishery products in packages with colorfully designed wrappings.

Government Recommendations

The government has requested the Ministry of Fisheries to raise the efficiency of the fishing fleet. To achieve this, it is essential

USSR (Contd.):

to provide the fleet with an explored and studied report of available fish stocks in the world ocean. The Ministry must develop and introduce, during 1969-1970, cost effective vessel-deployment schedules for every area of marine fishing.

New types of vessels will be built and the fleet will be equipped with modern fishing gear and technological plants. Facilities to repair the fishing vessels' technical equipment will be developed and training of qualified workers for ship repair trades will be expanded.

To satisfy the demand for high quality and great variety in fishery products, the Ministry was instructed to increase the catch of valuable species during 1969-1970, expand production of filleted fish and frozen semiproducts (not fully manufactured) on fishing vessels, and to develop commercial processing of smoked, pickled, dried, cured, and delicatessen fish products where they are consumed. By 1970, the Ministry also must assure an output of lightly and medium salted salmon products. ("Izvestiia," Jan. 28, 1969.)

* * *

POLICIES OF FISHERY MINISTRY ATTACKED

Two recent articles in a Soviet literary weekly attacked the Ministry of Fisheries and Minister A.A. Ishkov personally. The main charges were: (a) neglect of traditional inland fisheries; (b) excessive emphasis on marine fisheries, without due regard for fresh-water fisheries; (c) inadequate antipollution measures; (d) systematic overfishing in the Sea of Azov.

Marine vs. Inland

The articles reported that from 1913 to 1967 total Soviet fisheries catch increased 600% but inland catch increased only 25%. The latter is a decline if one considers Soviet population growth. Marine fishing is uneconomic and wasteful: cost of one metric ton for marine fish is 810 rubles (US$900), and for fresh-water fish 750 rubles (US$830), excluding transportation and storage costs. These are much less, if not negligible, for fresh-water fish since most of the catch is marketed on the spot.

The Fisheries Ministry's promotion policy is criticized as inadequate for encouraging the consumer to buy products from marine fish alien to Russian cuisine.

Water Pollution

Criticism was directed at the inadequate fight against water pollution. Ishkov's Ministry was accused of inefficiency since "no one there does anything about it." The Ministry's fish breeding, transplantation, and acclimatization practices were also attacked. The critic charged that it makes no sense to transplant fish to polluted water, where the resource has been destroyed and nothing is being done to clean the water.

The director of the Azov-Black Sea Research Institute for Fisheries and Oceanography is quoted as saying that nature, not man, is in control of reproduction and recruitment. We are far from influencing the qualitative and quantitative composition of fishery stocks through artificial fish-breeding operations.

Overfishing in Azov Sea

Overfishing in the Sea of Azov is said to have reached alarming proportions. Ishkov was criticized for evading the problem of the fishery kolkhozes (cooperatives) in the area. Where there are too many fishermen and too few fish, the result is widespread poaching and theft. Substantial quantities of fish, stolen from the kolkhozes, are sold at twice the regular price. Moreover, the Fisheries Ministry was accused of giving out inaccurate Azov Sea catch statistics. Actually, they are twice as high because of poaching.

Marine Fisheries Favored

The Fisheries Ministry also was criticized for pushing expansion of marine fisheries without too much concern about stock depletion, growing number of coastal states claiming ownership of Continental Shelf and extending their jurisdiction to 100 and even 200 miles offshore, and for not having "one single specialist on inland water bodies" on its staff. ("Literaturnaia Gazeta," No. 39, Sept. 25; No. 50, Dec. 11, 1968.)

[Comment: The author of the articles, Eligii Stavskii, may be incorrect about the inland catch data. According to official Fisheries Ministry statistics, inland catch for

USSR (Contd.):

1967 was about 810,000 metric tons. If the 1913 inland catch was 843,000 tons, this is a decrease of some 4%, not an increase of 25%.]

* * *

CATAMARAN TRAWLER TESTED SUCCESSFULLY IN NORTH ATLANTIC

A twin-hulled research trawler displacing 1,000 metric tons was successfully tested for a month in the Barents Sea. It is the first trawler of its kind in the world. The Kaliningrad-built vessel already had undergone navigation tests in the Baltic.

The Baltic tests proved the vessel easier to maneuver and more stable than conventional trawlers. The test cruise in the Barents Sea, during heavy winter storms, was intended to show whether the vessel could operate under toughest weather conditions. The test was fully successful.

Seaworthy

Scientific data on the vessel's navigational qualities showed that water pressure against the bridge connecting the hulls never exceeded 1.5 atmospheres, even during the heaviest seas. This section can withstand pressures up to 5.5 atmospheres. At wind force 10 on the Beaufort scale (wind speed between 55 and 63 miles an hour), she listed an average of 3 to 5 degrees, with a maximum list of 12 degrees. The deck remained dry, and the crew could work leisurely. On a conventional trawler, men could not have worked on deck for fear of being washed overboard.

* * *

OCEAN PERCH CLEANING MACHINE IN PRODUCTION

In 1967, the Vladivostok Machine Plant of the Far-Eastern Fisheries Administration manufactured the first machine for cleaning ocean perch. The gutting and cutting of ocean perch, a time- and labor-consuming operation, usually is performed manually in Soviet fisheries.

The semi-automatic production line, designed to process up to 180 fish per minute, virtually eliminates manual labor.

Tested Successfully

The machine was tested successfully aboard a freezer stern trawler of the Maritime Fisheries Administration, probably off Alaska. It is now ready for serial production. Four more semiautomatic ocean perch cleaning machines are nearing completion at the Vladivostok plant. ("Rybnoe Khoziaistvo," No. 9, 1968.)

* * *

CONFERENCE ON FISH BEHAVIOR

In late Feb. 1968, a conference on fish behavior, as related to fishing techniques and tactics, was held in Murmansk. It was organized by the Ministry of Fisheries to coordinate research on fish behavior, bring together scientists working on similar subjects in different institutes, and to formulate recommendations for future research.

PINRO Director A. P. Alekseev once said that "Soviet scientists are not behind foreign fish behavior scientists in a number of subjects. In certain subjects, for example in the formulation of theoretical principles and in the processing of collected test data, Soviet scientists are ahead of foreign scientists."

Subjects of Research

At Murmansk, 36 papers were presented on (1) fish behavior under natural conditions; (2) fish behavior in the area of fishing gear; (3) reactions of fish to an electric field, and to light, sound, and chemical stimuli; and (4) underwater research techniques.

The papers will be published by the Ministry of Fisheries. Some papers dealt with hydrostat "Sever-1" and research on distribution and behavior of cod and haddock at 500 meters just off bottom; hydroacoustic surveys determining behavior and distribution of Pacific hake and ocean perch; use of hydroacoustics in locating tuna concentrations; reaction of squid to light; and fish reaction to air curtain. Several scientists described the use of an underwater stereophoto camera. Authors and titles of papers are described in detail in the No. 6 issue of 'Voprosy Ikhtiologii' (1968), page 1117.

USSR (Contd.):

Recommendations

Soviet fishery scientists stressed the need to study Continental Slope fish stocks down to 1,500-2,000 meters as essential. This is because fishing on Continental Shelf already is fully developed--and availability of Shelf resources to Soviet fleets has decreased in recent years.

The following major research subjects were recommended for study: fish behavior under natural conditions, reaction to physical and chemical stimuli, experimental research on nervous system activities in fish, characteristics of vertical migration of fishes, and schooling behavior.

* * *

WHITE STURGEON AND STERLET CROSSBRED

An extraordinary cargo--fry of a new hybrid produced by crossing the white sturgeon and the sterlet--was airlifted a few months ago to Moscow from Rostov. Having inherited excellent taste qualities and the outer appearance of its parents, the hybrid has some new properties of great importance: it is more capable of growing and developing, and can be bred in ponds, while sterlet and white sturgeon live only in running waters.

The Rostov fry have acclimatized well in the ponds of the Moscow Region and grow in weight as fast as carps. (Novosti Press Agency.)

* * *

RESEARCH VESSEL CRUISES IN EQUATORIAL ATLANTIC

In early February 1969, the Soviet oceanographic vessel 'Akademik Kurchatov' left Kaliningrad on a 3-month cruise in the equatorial Atlantic. The scientists aboard will study ocean currents off Brazil, the Guianas, and in the Antilles. The vessel is expected to make port calls at Rio de Janeiro, Georgetown (British Guyana), and some islands in the Caribbean.

The expedition is headed by Dr. Vladimir Kort, the former Director of the Institute of Oceanology of the USSR Academy of Sciences. ("Vodnyi Transport," Feb. 4, 1969.)

* * *

RESEARCH CRUISE IN SOUTHWEST PACIFIC

A main purpose of the cruise of the Soviet research vessel 'Vitiaz' is to determine the viability of large-scale fish farming to increase the marine catches. M.E. Vinogradov, Deputy Director of the USSR Science Academy Oceanology Institute and head of the expedition, reported on the first 2 months in the southwest Pacific.

What Scientists Did

At scientific stations in the Gilbert Islands, New Caledonia, and the New Hebrides, the vessel's scientists used radioisotopes to determine certain aspects of the microfauna and microflora, tested the amount of nucleonic acid in fish to establish their growth rates; studied the vertical distribution of animals in the ocean using bathyphotometers to record the luminescence of sea organisms; measured the formation rates of microflora forming mineral salts and the rates at which the salts are consumed by fish and other marine animals. Other studies dealt with the role of bacteria in the formation and development of marine food chains.

French Advice

During a call at Noumea, French New Caledonia, in early Jan., the Soviet scientists met with French biologists studying the South Pacific. The French advised the Soviets on selecting an appropriate research area in the Coral Sea. Vitiaz resupplied in Brisbane, Australia, before continuing research in the equatorial Pacific. ("Izvestiia," Jan. 31, 1969.)

The Soviet scientists were invited by Australians to visit the Great Barrier Reef research station on Heron Island, where they visited laboratories and conducted research on luminescence of corals and other animals.

The cruise is completed, and M. E. Vinogradov summarized its results in official Izvestiia as follows. The expedition collected a unique complex of quantitative data on the biological productivity of the ocean. The

USSR (Contd.):

growth rate of animals feeding on microscopic algae was determined for the first time. Previously, bacterial cells were not considered food because of their size, and to explain their role in plankton the scientists measured the amount of energy transferred from one food level to another. It was shown that bacteria form special agglomerations of great importance as a food component for small marine animals. Intensive plankton research with special nets, bathyphotometers, and radioisotopes determined the intensity of photosynthesis, and yielded for the first time a detailed picture of the vertical distribution of plankton. Large, stable accumulations of animals, microorganisms and detritus were discovered at depths of several dozen meters. These strata perform extremely important functions in the life of the ocean's upper layers.

The material collected by the expedition will be used to design a mathematical model of the vital links between marine animals, and to compile a generalized "biological productivity map" of the ocean. ('Izvestiia,' Feb. 20, 1969.) On her way to Vladivostok, the Vitiaz called at Nagasaki, where the Soviet scientists met with their Japanese colleagues.

CARIBBEAN

Haiti

SPINY LOBSTER EXPORTERS ORGANIZE TO FORCE DOWN EXVESSEL PRICE

Three of Haiti's 6 spiny lobster exporters agreed in Jan. 1969 to pay only markedly reduced prices for spiny lobster tails--65 US cents a pound to independent fishermen, and 80 cents a pound to "speculateurs," middlemen who buy from native fishermen. Previous price as as much as US$1 a pound to fishermen, $1.10 to "speculateurs." Success of effort is not expected to result in lower spiny lobster tail prices for U.S. importers. (U.S. Embassy, Port-Au-Prince, Feb. 7.)

IS SEAWEED A WEED? WHAT IS IT AND HOW DOES IT GROW?

Plants as useful as seaweed can hardly be considered weeds because weeds are commonly defined as uncultivated (wild) plants that are useless, unsightly, and have no economic value. Seaweed is used as a food by millions of people, particularly along the Pacific Coast of Asia; it also serves as food for livestock.

Seaweed has many other uses, for example, as fertilizer, medicines, source of iodine, and ingredients used in preparation of bread, candy, canned meat, ice cream, jellies, and emulsions.

In the late 18th century seaweed was the primary source of soda until other sources became more economical and practical. In these years, thousands of tons of soda were derived from sea plants.

Attached seaweeds grow only along the narrow border near shore. Growth is depth limited because natural sunlight is needed for the photosynthesis processes of the plants. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

LATIN AMERICA

Brazil

SHRIMP EXPORTS TO U.S. RISE SHARPLY

U.S. imports of Brazilian shrimp in 1968 increased sharply over previous years. The trend is expected to continue. U.S. imports through November 1968 were almost 7 times the 1967 total. From 1960 through 1964, annual U.S. imports ranged from 7,500 to 57,450 pounds. In 1966, shrimp imports from Brazil were 473,223 pounds. Efforts by new interests forecast increases in production from Brazil's largely untapped shrimp resources.

U.S. Imports[1/] of Brazilian Shrimp

Month	1968	1967	1966
	(1,000 Pounds)		
Jan.	22	23	11
Feb.	11	6	-
Mar.	-	4	102
Apr.	-	22	92
May	236	7	26
June	12	-	95
July	197	6	19
Aug.	193	2	78
Sept.	17	-	36
Oct.	198	-	24
Nov.	300	57	3
Dec.	n/a	49	-
Total	1,186	176	486

1/U.S. Import Statistics, U.S. Bureau of the Census.

U.S. Interests

Two firms were established at the mouth of the Amazon in Belem by U.S. interests. Together, these firms plan to export more than 4 million pounds of shrimp annually to the U.S. This would be almost 3.5 times as much as all Brazilian shrimp exports to the U.S. in 1968. Shipments will begin some time in 1969.

In the state of Sao Paulo, one large firm and several smaller firms already are exporting frozen shrimp to the U.S. The large firm reportedly exported more than 500,000 pounds during second-half 1968.

Shrimp-processing firms in Sao Paulo and elsewhere are interested in marketing their product in the U.S. and want to contact U.S. buyers and investors. (U.S. Consulate, Sao Paulo, Dec. 31, 1968.)

Mexico

PILOT FISHING PORT COMPLEX SUCCESSFUL

Mexico's pilot fishing complex at Alvarado, Veracruz, on the Gulf of Mexico, operated successfully during 1968. Overall production was up from 1967 and, according to the director, would have been higher had 15 trawlers on order been delivered on time. (U.S. Embassy, Mexico, Feb. 19.)

Fish and Fishery Product Production

Species	1968	1967
	(Metric Tons)	
Mackerel	1,161.5	1,075.1
Clams	912.7	1,511.3
Snook	464.6	-
Shrimp (headless)	299.6	268.9
Red snapper	83.4	-
Shrimp (heads-on)	47.3	29.9
Crab, cleaned	20.4	-
Squid	14.2	-
Sharkskin, salted	12.4	-
Shark fins	2.6	-
Total	3,018.7	

	Number
Boats operating	18
Boats under construction	15
Employees	287
	Tons
Fish canned worth $2,000,000 pesos (US$160,000).	182.5

Unloading frozen ("headed") bigeye tuna from a Taiwanese longliner at Abidjan, Ivory Coast. The vessel fished in the tropical Atlantic. The tunas weigh about 150 lbs. (Photo: Peter Wilson, TABL, BCF.)

ASIA

Japan

1968 CANNED TUNA IN BRINE EXPORTS TO U.S.

Japan exported 3,090,816 cases (48 7-oz. cans) of canned tuna in brine to the U.S. in 1968. This was 97% of the quantity which could be imported into the U.S. under the lower tariff of 11% ad valorem. The 1968 U.S. import quota for brine-packed tuna was 3,189,764 cases; any imports in excess of that would have been dutiable at 22% ad valorem.

Imports from other countries are estimated to have been around 400,000 cases, for a total of close to 3.5 million cases, about 300,000 cases over the quota. The cut-off point for imports under the lower tariff rate was reached in mid-December: thereafter, about 500,000 cases were placed in U.S.-bonded warehouses. ('Kanzume Nippo,' Feb. 18, 1969.)

* * *

FACTORYSHIPS LEAD BOTTOMFISH FISHERY IN E. BERING SEA

Two trawl fleets, led by the factoryships 'Chichibu Maru,' 7,472 gross tons (GT) owned by Nichiro Fishing Co., and 'Kashima Maru,' 7,163 GT (Nihon Suisan), are operating in the Bering Sea bottomfish fishery.

The factoryship 'Soyo Maru,' 11,192 GT (Taiyo), fishing there until Jan. 18, returned home on Jan. 26. After undergoing hull extension, she is scheduled to depart for the Bering Sea on Apr. 10, and return home again in late November.

Other Fleets Assigned

Other factoryship fleets assigned to the Bering Sea fishery this year and scheduled departure and return dates are: 'Hoyo Maru,' 14,094 GT (Hoko Suisan), mid-Apr., late October; 'Gyokuei Maru,' 10,357 GT (Nihon Suisan), Feb. 23, Oct. 4; 'Shikishima Maru,' 10,144 GT (Nihon Suisan), Feb. 27, Oct. 7; 'Nisshin Maru No. 2,' 27,035 GT (Taiyo), Feb. 1, late October; 'Seifu Maru,' 8,269 GT (Kokusai Gyogyo), departure date unknown. ('Suisan Tsushin,' Jan. 29, 1969.)

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BERING SEA BOTTOMFISH CATCH ROSE IN 1968

Bottomfish catch by 12 factoryship fleets in the Bering Sea reached 819,000 metric tons in 1968 (see table). Alaska pollock, the principal species used in producing minced meat aboard factoryships, predominated with 686,000 tons, or about 84% of total fleet catch, reflecting the effort made in minced meat production. ("Nihon Suisan Shimbun," Feb. 24, 1969.)

Bering Sea Bottomfish Catch

Species	1968	1967
	(Metric Tons)	
Alaska pollock	686,000	566,000
Flatfish	42,000	76,000
Pacific cod	37,000	32,000
Herring	17,000	31,000
Turbot	16,000	23,000
Rockfish	9,000	31,000
Shrimp	8,000	3,000
Sablefish	2,000	7,000
Other	2,000	2,000
Total	819,000	771,000

* * *

TUNA FLEET SIZE CHANGES LITTLE

By the end of 1968, 1,161 Japanese vessels, excluding those used seasonally, were licensed for the distant-water tuna fishery, the Japanese Fisheries Agency reports. Fleet size has not changed much during the past 5-6 years.

Vessel Sizes and Management Units, 1963-68

Size Range	1968	1967	1963
Gross Ton	(No. of Vessels)		
Under 100	240	318	457
100-180	279	260	150
180-240	246	229	193
240-300	137	131	132
Over 400	64	72	76
Total	1,161	1,165	1,152
Seasonally employed vessels	122	125	184

A downtrend in management units was marked by a decrease in number of enterprises owned by individuals, and an increase in corporation ownership. For example, in 1968 individual ownership totaled 257 units, and corporation ownership 363 units, compared with 530 and 184 units in 1963. ('Katsuo-maguro Tsushin,' Jan. 30, 1969.)

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Japan (Contd.):

TUNA LONG LINERS BUILT

Three new types of tuna long liners for the distant-water tuna fishery have been developed and built in the past two years. Each has a slightly different characteristic, but all have been designed to provide greater maneuverability and safety in adverse weather, and to reduce manpower requirements through mechanization. Equipped with modern navigational instruments--radar, loran, direction finder, fish finder, and facsimile communication equipment--the new vessels are the most efficient Japanese tuna long liners presently in operation.

"Pioneer" Type

The first, a Pioneer-type long liner, was built in Oct. 1967 by Kanasashi Shipbuilding Co. The vessel, between 299 and 345 gross tons, employs line haulers and other labor-saving devices. These reduced manpower to 18 crewmen. A newly developed freezing system improves the keeping quality of fish sufficently to bring an additional $378 a ton or more on the Japanese fresh-fish market. Over 20 new long liners of this type have been built already and are fishing southern bluefin off Australia.

Kanasashi's newest vessel of this type is 'Chiyo Maru No. 18,' completed Jan. 22, 1969. Principal specifications: overall length 171.9 feet, draft 11.8 feet, maximum speed 13 knots, cruising speed 11 knots, freezing capacity 16 tons a day, complement 20.

Double-Decked Long Liner

The second new type is a double-decked long liner built by Narasaki Shipyards. The bridge of this vessel has been located in the afterdeck to improve stability and provide greater fish-carrying capacity. Two recently built vessels of this type are now fishing southern bluefin off Australia. One is the 284-ton 'Zuiho Maru No. 11,' completed in Nov. 1968. Principal specifications: length 142.7 feet, beam 27.6 feet, draft 11.6 feet, maximum speed 13.4 knots, cruising speed 12.1 knots, freezing capacity 50 tons a day.

"All-Weather" Long Liner

The third is an "All Weather" (AW) long liner built by Niigata Steelworks. The AW vessels, with a bulbous bow to increase cruising speed, were designed to operate under rough weather conditions in the high latitudes off southern Australia. Seven vessels in this series are scheduled for construction in 1969. Two are already in operation. The 255-ton 'Fuji Maru No. 68,' completed Jan. 31, 1969, has a length of 133.2 feet, beam of 25.9 feet, draft of 11.5 feet, and a cruising speed of 10.5 knots with a maximum 13.34 knots. She is equipped with a trolley-type semi-air blast freezing system.

The second 255-ton AW long liner, 'Yakushi Maru No. 38,' recently departed on her maiden voyage to the eastern Pacific to fish tuna off Mexico. ("Suisan Keizai Shimbun," Feb. 28 & Mar. 4, 1969.)

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TUNA FISHERMEN HAMPERED BY SHORTAGE OF BAIT SAURY

Part-time tuna fishery operators in Shiogama, getting ready early in March to put in one more tuna trip before shifting to salmon, found it virtually impossible to obtain bait saury. Shiogama is a large fishing port in northeastern Japan.

Scarcity of saury, caused by poor fishing in 1968, had sent prices soaring. The fishermen were unable to buy bait saury even at the exvessel price of about US$454 a short ton. Normally, prices for bait saury are around $176-202 a short ton. By end of 1968, prices had risen to a high of $378. ("Suisan Keizai Shimbun," Mar. 4, 1969.)

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SHRIMP FISHERY IS ACTIVE OFF SOUTH AMERICA

About 50 independent Japanese shrimp trawlers, and a mothership fleet of 22 vessels, are shrimp fishing off the Guianas, northeast South America. Some independent trawlers are making money. But others, especially those that entered the fishery in 1968, are still operating at a loss. This is due to their unfamiliarity with the grounds, and lack of crew experience with U.S.-built double-rigged trawlers.

Nichiro Lost Money

Because of those factors, and labor-management problems, the mothership fleet

Japan (Contd.):

(owned by Nichiro Fishing Co.) lost about US$972,000 in 1968. Catches are averaging close to 500 pounds, heads off, per day, compared with around 350 pounds when the vessels first started fishing. ('Suisan Tsushin,' Jan. 22, 1969.)

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TRADERS SEEK COMPENSATION
FROM PHILIPPINE FIRMS

Nine Japanese trading firms are seeking compensation from 2 Philippine buyers for nonperformance of purchase contracts involving 316,500 cases (1-lb. tall 48's) of canned mackerel packed in Hokkaido, Japan.

In Aug. 1968, the Philippine firms contracted for 450,000 cases of canned mackerel, but failed to set up letters of credit for 316,500 cases scheduled for shipment by the end of Jan. 1969. The Japanese are demanding penalty payments of $40,005 from one firm and $14,070 from the other, for 3 months' interest charge and storage costs. ('Suisan Tsushin,' Feb. 26, 1969.)

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SHRIMP IMPORTS
DROPPED IN 1968

Frozen shrimp imports in 1968--35,204 metric tons valued at about US$78.1 million--were down 21% in volume and 2% in value from 1967. It was the first decline since 1961.

Purchases from the Soviet Union slumped to 1,418 tons from 9,836 in 1967. Japan imports small red shrimp from the USSR and markets them peeled and cooked.

The 5 leading shrimp suppliers in 1968 were Mexico, 5,769 tons worth US$14,577,158; Thailand, 4,581; Communist China, 3,769; Hong Kong, 3,628; and India, 3,164.

Jan. 1969 Imports

Jan. 1969 frozen shrimp imports--2,884 metric tons worth about US$7 million--were down 723 tons from Dec. 1968, and about 500 tons from Jan. 1968. Communist China with 664 tons, worth US$1,027,800, was leading supplier. Other major suppliers were Mexico, 530 tons; Thailand, 353 tons; Pakistan, 266; Hong Kong, 230; Indonesia, 161; India, 132; and South Korea, 53. ('Suisan Tsushin,' Feb. 5 and 25, 1969.)

日本

South Korea

SETS PLANS FOR
1969 FISHING IN BERING SEA

South Korea planned to send one 9,400-gross-ton mothership and about 20 trawlers to the Bering Sea on April 1, 1969, according to Japanese industry sources. The operation was to be sponsored jointly by the Korea Marine Industry Development Corp., Samyang Fishing Co., and Shin Hung Refrigeration Co. A South Korean fishery official was reported saying that this year's expedition is a commercial extension of experimental operations conducted in the past two years.

He also said that the South Korean Fisheries Office is arranging a low-interest loan totaling around 400 million won (about US$1.4 million) to help vessel owners pay pre-departure expenses. An official of the South Korean Embassy in Tokyo stated on Jan. 31 that the fleet will not fish salmon. ('Nihon Suisan Shimbun,' Jan. 31, and 'Shin Suisan Shimbun Sokuho,' Feb. 1, 1969.)

The semi-Government Korea Marine Industry Development Corp. has been conducting exploratory fishing in the northeast Pacific with 1 stern trawler since 1967. The catch was mostly Alaska pollock. The operation reportedly is paying off through sales on domestic markets. The 1967 and 1968 operations of the Samyang Fishing Co. were poorly organized and probably a financial failure. The Shin Hung Co. recently was active in exploratory fishing for shrimp off Indonesia. Reportedly, results were below expectations. Merger of operations of the 3 companies probably indicates the 2 private companies will rely more during 1969 on available government expertise and able management introduced into the Korea Marine Industry Development Corp. by its present general manager, Mr. Oh, former director of ROK's Office of Fisheries.

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FISH CARRIER
LAUNCHED IN JAPAN

A 1,000-ton refrigerated carrier, ordered by the South Korean Koyo Distant Water Fishing Company, was launched in early November 1968 in Shizuoka Prefecture, Japan. The firm, largest in South Korea tuna fishing,

South Korea (Contd.):

owns 21 tuna vessels--ten 300-ton, ten 200-ton, and one 190-ton craft. They operate in the Indian and Atlantic Oceans.

In 1969, the firm plans to add two 500-ton fishing vessels as well as the 1,000-ton refrigerated carrier, to its tuna fleet. ('Suisancho Nippo,' Nov. 6, 1968.)

Taiwan

1968 FISHERY CATCH INCREASED 15.9%

Taiwan's fishery catch in 1968 was 531,045 metric tons, 15.9 percent more than in 1967.

Type of Fishery	1968	1967
	(Metric Tons)	
Deep-sea fisheries	241,458	189,097
Outer coastal fisheries	208,139	186,543
Inner coastal fisheries	24,861	26,316
Fish culture	56,587	56,181
Total	531,045	458,137

Deep-Sea Catch Rose Most

The deep-sea fishery catch was up 27.7% from 1967. This was the largest increase of any Taiwanese fishery. It was due principally to increased catches of tuna vessels added to the fleet in 1967 and 1968. Included are 80,475 tons caught by foreign-based Taiwanese vessels fishing in the Indian Ocean and in the Atlantic. The 1968 landings of the overseas-based Taiwanese fleet were up 109.4 percent from 1967's 38,396 tons.

Outer Coastal Catch Also Increased

The outer coastal catch was up 11.6 percent from 1967. This resulted principally from increased sardine and mackerel landings (up 19 and 120%, respectively) and higher shrimp catches (up 30%). (T.P. Chen, Chief, Fisheries Division, Joint Commission on Rural Reconstruction, Taipei, Republic of China.)

Ceylon

FISHERY DEVELOPMENT PROGRAM

Ceylon is developing her fishing industry to increase the domestic fish supply and to expand the industry's economic base. Many coastal inhabitants depend on fishing for their livelihood. The government has been working to develop the industry through the Department of Fisheries and the Ceylon Fisheries Development Corporation. Cooperative societies also may play a large part.

Industry Objectives

The functions assigned to the Ceylon Fisheries Corp. paint a good picture of industry objectives. The corporation will undertake (1) Fishing operations including deep-sea trawling; (2) Fish processing, canning, curing, drying and by-products; (3) Wholesale or retail marketing and distribution; (4) Construction and maintenance of fishery harbors and shore installations, including cold rooms; (5) Import and export of fish and fish products; (6) Import and sale of gear, tackle, and other necessary products. (7) Assist the Fisheries Department or any other department; (8) Construct boats and other craft for the fishing industry; (9) Repair and maintain facilities for fishing boats.

Current and Planned Projects

Fleet development is of prime importance. The present fleet is composed of small, nonmotorized craft and must return to port each day. The government is increasing the number of small mechanized craft. Harbor development is necessary. Mutwal is the only harbor, and it is too small. Most landing points are merely along beaches, and this will continue for many years despite planned harbor construction. The government has started a pilot plant to can sardines and mackerel; a tuna cannery in North Ceylon is expected to open this year. The distribution system will be improved. Marketing terminals already exist at Colombo, the main distribution center, Kandy, and Kurunegala. The socio-economic aspects of such a large development program have not been overlooked. ('Mainichi,' Feb. 4, 1969.)

SOUTH PACIFIC

Australia

CALL CRAYFISH ROCK LOBSTER, GROUP PROPOSES

The Rock Lobster and Prawning Assoc. of Australia wants to change the name of crayfish to rock lobster (spiny lobster in U.S.). The Association decided to change crayfish to rock lobster because of French proposals, put forward in the Codex standard, to use the name crawfish. If this were done, the Association felt, the price of Australian craytails sold in the U.S. would drop.

Uniform Names

The standard names of southern crayfish (Jasus lalandei) and western crayfish (Panulirus cygnus) were adopted in 1962 by the Commonwealth-States Fisheries Conference. A comprehensive list of uniform names for most commercial fish species was prepared at that same time. These names have been used in official publications.

The main reason for compiling a list was to achieve uniformity in statistical data. Any change in uniform name must be approved by the Standing Committee on Fisheries.

Common Names

Although crayfish is the name most fishermen use for southern and western crayfish, research workers call it spiny or rock lobster. It is marketed overseas as rock lobster (spiny lobster in U.S.).

Overseas, crayfish normally means freshwater crustaceans; lobster is usually the name for marine crustaceans with crab-like claws. There are no true lobsters in Australian waters. ('Australian Fisheries,' Jan. 1969; formerly 'Australian Fisheries Newsletter.' Name was changed Jan. 1969.)

AFRICA

Ghana

RELEASES SOVIET TRAWLERS

On Mar. 1, Ghana released 2 Soviet trawlers and their crews held since Oct. 10, 1968. A public statement on Mar. 3 announced that the 2 captains and 1 crew member will remain in Accra to assist a Commission investigating the activities of Air Marshal Otu. Allegedly he had attempted a coup d'état to bring back exiled former President Kwame Nkrumah. The Soviet trawlers were suspected of participating in the alleged plot.

Ghanaian Statement

The statement blamed "obstructive tactics" of the Soviet captains and crews for prolonging investigation of their intrusion into Ghana's territorial waters. The statement noted that Ghana's security was "not compromised" by release of the Soviet trawlers and crews; also, investigations by Ghanaian security services were not influenced by diplomatic pressures, and the decision to release the Soviets was taken "entirely" on the Government's initiative.

The statement added that Ghana desires friendly relations with the Soviet Union, but the powerful USSR must base her relations with Ghana on principles of equality, mutual respect, territorial integrity, and non-interference in internal affairs.

Language Barrier

In the Otu hearings, the investigative Commission apparently ran into language problems. On Mar. 4, the 2 Soviet skippers could not testify because no suitable interpreter was available. The hearing, therefore, was postponed until Mar. 7. (U.S. Embassy, Accra, Mar. 4, 1969.)

Fines

The 2 captains were fined about US$200 each for illegally sailing in Ghana's territorial waters. The trawlers left Takoradi for the USSR on March 4.

FOOD FISH FACTS

The Dungeness crab is found along the Pacific coast from Alaska to southern California. It is named after a small fishing village, on the Strait of Juan de Fuca in Washington, where commercial fishing for this crab began.

Dungeness Crab
(Cancer magister)

DESCRIPTION

The Dungeness crab is light reddish-brown on the back with a pattern of lighter streaks and spots. In some specimens, the anterior portion of the back is purplish. The underside varies from whitish to light orange, and the inner and upper sides of the anterior legs are colored crimson or purple. The large, hard-shelled crab measures up to 10 inches across the back and may weigh from $1\frac{3}{4}$ to $3\frac{1}{2}$ pounds.

HABITAT

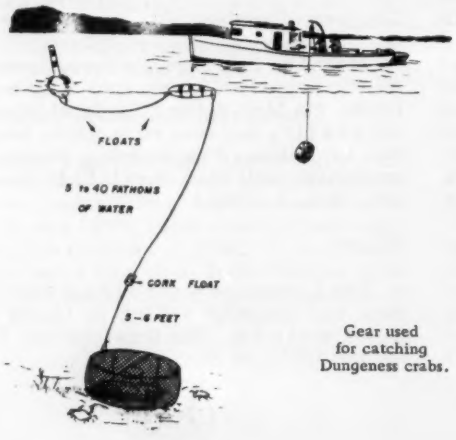
Although the Dungeness crab is found along thousands of miles of coastal areas, it is only known to inhabit sandy and grassy bottoms below the tidal range.

HISTORY OF FISHERY

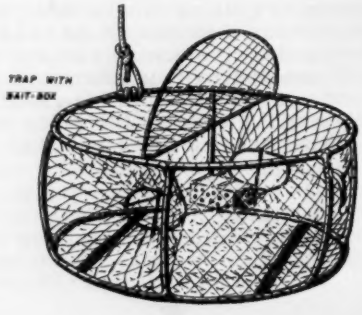
The Dungeness crab fishery is the oldest known shellfishery of the North Pacific Coast. Many years before the arrival of the white man, natives along the Strait of Juan de Fuca trapped crabs in crude homemade pots. The settlers were quick to realize the value of the Dungeness crab and began fishing for them.

CRAB FISHING

Fishing for Dungeness crabs is principally in offshore waters from 12 to 120 feet, with only incidental catches from estuaries. Occasionally crabs may be caught in depths up to 240 feet. Dungeness crabs are caught by pots and ring nets, using fresh or frozen bait such as razor clams, squid, or fresh fish. During the fishing season, fishermen move their pots according to the movements of the crabs; one week, crabs may be found in depths of 12 feet; the following week, they may be found in depths of 90 to 120 feet.



Gear used
for catching
Dungeness crabs.



(Continued following page.)

CONSERVATION

Although commercial fishing regulations vary in different areas, there is one regulation in effect wherever the Dungeness crab is fished--only male crabs of a specific minimum width of shell may be taken. The minimum legal widths are set by states, and presently vary from $5\frac{3}{4}$ to $6\frac{1}{2}$ inches, depending on the locality from which the crab is taken. The crabs reach legal size in 3 to 4 years and probably live for about 8 years.

In spite of these important conservation measures, the abundance and catch of Dungeness crab has fluctuated greatly from year to year. The supply and cost to the consumer has varied as a direct result. Fishery scientists have long suspected that some factor or combination of factors in the environment were responsible for these fluctuations.

In recognition of the need to assist the states in managing their fishery resources, Congress passed the Commercial Fisheries Research and Development Act of 1964. These cost-sharing, cooperative Federal Aid Programs are administered in the Department of the Interior by the Bureau of Commercial Fisheries.

Under this program a study was initiated to determine the effects of temperature, salinity, and other factors on the survival of young Dungeness crabs. Experiments have shown that low water temperatures slow growth. The young crabs are at the mercy of currents during their early life. Slow growth gives more time for the young to be carried out to extremely deep waters where they cannot survive. Through further research scientists may be able to predict the abundance of this important seafood, thus benefiting the consumer.

USE OF DUNGENESS CRAB MEAT

Dungeness crab meat is available by the pound already cooked, with the picked meat from body and claws sold as one grade. Whole, cooked Dungeness crab is also available, either fresh or frozen. Some of the crab meat is canned, usually in $6\frac{1}{2}$ ounce cans. Dungeness crab meat can be used interchangeably with other crab meat in most recipes. It is an excellent source of easily digested protein and vitamins (especially thiamine, niacin, and riboflavin), but is low in fat and calorie content. Use Dungeness crab meat in canapes, appetizers, dips, sauces, cocktails, salads, cakes, chowders, or a wide variety of entrees. (Source: National Marketing Services Office, Bureau of Commercial Fisheries, U.S. Department of the Interior, 100 East Ohio, Room 526, Chicago, Illinois 60611.)

(Recipe on p. 68)

CRAB MEAT--A SLIMMING TREAT FOR SPRING

Dreaming about a new spring wardrobe? Most people are this time of year but it is only the fortunate few who are ready for it. Most of us have some winter-accumulated pounds to lose first. That's right--the word for now is--DIET! However, dieting isn't really that difficult, not if you have discovered the wonderful world of fish and shellfish. There is an ocean of tasty, satisfying seafoods waiting for you that are high in the things that count--high-quality protein, vitamins, and minerals; and low in the things that count--fat content and calories.

Dungeness crab meat, one of America's choicest seafood treats, is an excellent source of all the food elements that are needed for good nutrition. Long popular on the Pacific coast, this fine, fresh crab meat is available now in Midwest and Atlantic coast markets because of increased use of air-freight. Meat from the body of the Dungeness crab is white, while the claw meat is slightly red or with a pinkish tinge. The fresh-cooked meat is picked from both body and claws, marketed as one grade, and sold by the pound. Whole, cooked Dungeness crab is also available at fresh or frozen seafood counters. Crab meat can be prepared in a wide variety of interesting ways, and it can be purchased canned, fresh, or frozen.

An old-time favorite way to prepare Dungeness crab meat is in world-famous Dungeness Crab Louis, and this recipe from the Bureau of Commercial Fisheries fits very well into diet menus. The crab meat crowns a bed of lettuce surrounded with tomato, hard-cooked egg, and cucumber slices. Top with famous Louis dressing, or substitute your own low-cal mixture, and you are up and away for a cool, refreshing experience with this gourmet salad.

DUNGENESS CRAB LOUIS

- 1 pound Dungeness crab meat, fresh or frozen
- 1 head lettuce
- Salt
- 4 tomatoes, sliced
- 3 hard-cooked eggs, sliced
- 1 cucumber, sliced
- Louis Dressing

Thaw frozen crab meat. Drain crab meat. Remove any shell or cartilage. Shred lettuce and place in a large shallow salad bowl. Sprinkle with salt. Arrange crab meat over the lettuce. Place alternate slices of tomato, egg, and cucumber around the edge. Serve with Louis Dressing. Makes 6 servings.

LOUIS DRESSING

- ½ cup mayonnaise or salad dressing
- 2 tablespoons chili sauce
- 2 tablespoons chopped green onions
- 2 tablespoons chopped green pepper
- 1 hard-cooked eggs, chopped
- 1 tablespoon chopped olives
- ½ teaspoon lemon juice
- Dash salt
- Dash pepper

Combine all ingredients and chill. Makes approximately 1 cup sauce.

Would you like to have more crab meat recipes? "How To Cook Crabs" (1 49.39:10) is available for 20¢. Another booklet, in full-color, "Seafood Slimmers" (1 49.49/2:7) is filled with delightful and delicious fish and shellfish recipes with calorie content per serving given. It costs 25¢, and both booklets are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. (Source: National Marketing Services Office, BCF, 100 East Ohio, Rm. 526, Chicago, Ill. 60611.)

INDEX

Page

UNITED STATES:

1 .. U. S. Fishermen Caught 4.1 Billion Pounds in 1968 Worth $471.5 Million
4 .. Gloucester Herring-Alewife Fishery Rises Sharply
4 .. Study Spring Spawning of Georges Bank Haddock
4 .. Demand for Ocean Quahogs Grows
5 .. BCF's 'Oregon II' Finds Heavy Fish Concentrations Off Louisiana
5 .. Salmon & Steelhead Trout Culture Practiced
5 .. Record Stocking of Fish in Great Lakes Scheduled
6 .. East Coast Aquatic Plant Harms Clams and Oysters
6 .. Wisconsin U. Opens Eutrophication Center
7 .. Demand for Fresh Fish Increases in Midwest
7 .. Food Buyers from Abroad to Attend U.S. Conference
7 .. 1969 'International Code of Signals' Is Available
8 .. 'Seafreeze Atlantic' Sails on First Fishing Trip
10 .. Fishery Legislation Proposed in Congress

Oceanography:

11 .. Vast Study of Atlantic East of Barbados Starts in May
15 .. Bathymetric Charts Guide Mariners
17 .. Camera Mounted on Diving Vehicle Saves Oceanographers Time
18 .. Nation's First Estuarine Prediction Service in Maine to be Evaluated
18 .. Survey N. Carolina Seabed
19 .. Chart 'Fishermen's Paradise' in Everglades National Park
20 .. Can Satellites Be Used to Measure Wave Heights?
21 .. Foreign Fishing Off U.S. in February 1969

States:

California:

25 .. Fish & Game Dept. Issues 1968 Annual Report

Oregon:

26 .. Willamette Steelhead Population Increased in State Program
27 .. Governor Dedicates Ultramodern Elk River Salmon Hatchery

Texas:

27 .. 8,000 Tagged Shrimp Released
28 .. A Preliminary Review of the Potential Deep-Water Fishery Off Texas Between 50 and 300 Fm., by R. Spencer Gaille

ARTICLES

30 .. Longlining for Swordfish in the Eastern Pacific, by Susumu Kato
33 .. Method for Protecting Lake Trout Taken in Trawls, by Alfred Larsen and Warren Handwork
36 .. South Korean Fisheries Off Alaska, by Virgil N. Crosby
39 .. BOOKS

INTERNATIONAL:

43 .. Government Experts Report on Expanded Nordic Economic Cooperation
44 .. Prospects for European Industrial Fisheries
44 .. 1968 World Fish Meal Production Was 6% Over 1967
45 .. FEO Fish Meal Exports Rose 20% in 1968

Page

INTERNATIONAL (Contd.):

45 .. Marine Oil Production
46 .. Thermal Pollution Endangers Fish
46 .. Japan & Canada Conduct Joint Whaling Venture
47 .. Japan & USSR Hold Crab-Fishing Conference
47 .. Fear Depletion of North Sea Fishery Resources

FOREIGN:

Canada:

48 .. Plans Fishermen's School
48 .. Conference on Queen Crab Scheduled
48 .. Quebec Does Not Renew Fishing Subsidies
48 .. 'Greenland Turbot' Promotion Begins

Europe:

Norway:

49 .. Landings Declined in 1968
49 .. Stockfish Marketing Prospects Are Good
50 .. Mixed Reaction to U.K. Tariff on Frozen Fish
50 .. Barents Sea Has Fish Conservation Problem
51 .. Norway Forbids Danish Trout-Egg Imports
51 .. Exploratory Fishing in Gulf of Maine

Denmark:

51 .. Greenland's 1968 Salmon Catch Is Well Below 1967's
52 .. Faroese Fishermen's Strike Settled
52 .. Small Haddock Pose Problem
52 .. Fish Meal, Oil, and Solubles Production, 1967-68

Sweden:

52 .. The Shrimp Trade

United Kingdom:

53 .. White Fish Authority Raises Interest Rates

West Germany:

53 .. A Review of West German Oceanography

Netherlands:

54 .. Fisheries Minister Notes Decline of North Sea Fishing

Iceland:

54 .. Decline in Herring Drastically Reduces 1968 Catch

USSR:

54 .. Council of Ministers Prods Ministry of Fisheries
55 .. Policies of Fishery Ministry Attacked
56 .. Catamaran Trawler Tested Successfully in North Atlantic
56 .. Ocean Perch Cleaning Machine in Production
56 .. Conference on Fish Behavior
57 .. White Sturgeon and Sterlet Crossbred
57 .. Research Vessel Cruises in Equatorial Atlantic
57 .. Research Cruise in Southwest Pacific

Caribbean:

Haiti:

58 .. Spiny Lobster Exporters Organize to Force Down Exvessel Price

Latin America:

Brazil:

59 .. Shrimp Exports to U.S. Rise Sharply

Mexico:

59 .. Pilot Fishing Port Complex Successful

Asia:

Japan:

61 .. 1968 Canned Tuna in Brine Exports to U.S.

Index continued page 70.

INDEX (CONTINUED)

Page

FOREIGN (Contd.):
Asia (Contd.):
Japan (Contd.):
61 .. Factoryships Lead Bottomfish Fishery in E. Bering Sea
61 .. Bering Sea Bottomfish Catch Rose in 1968
61 .. Tuna Fleet Size Changes Little
62 .. Tuna Long Liners Built
62 .. Tuna Fishermen Hampered by Shortage of Bait Saury
62 .. Shrimp Fishery Is Active Off South America
63 .. Traders Seek Compensation from Philippine Firms
63 .. Shrimp Imports Dropped in 1968

Page

FOREIGN (Contd.):
Asia (Contd.):
South Korea:
63 .. Sets Plans for 1969 Fishing in Bering Sea
63 .. Fish Carrier Launched in Japan
Taiwan:
64 .. 1968 Fishery Catch Increased 15.9%
Ceylon:
64 .. Fishery Development Program
South Pacific:
Australia:
65 .. Call Crayfish Rock Lobster, Group Proposes
Africa:
Ghana:
65 .. Releases Soviet Trawlers
69 .. INDEX

WHY IS THE OCEAN BLUE?

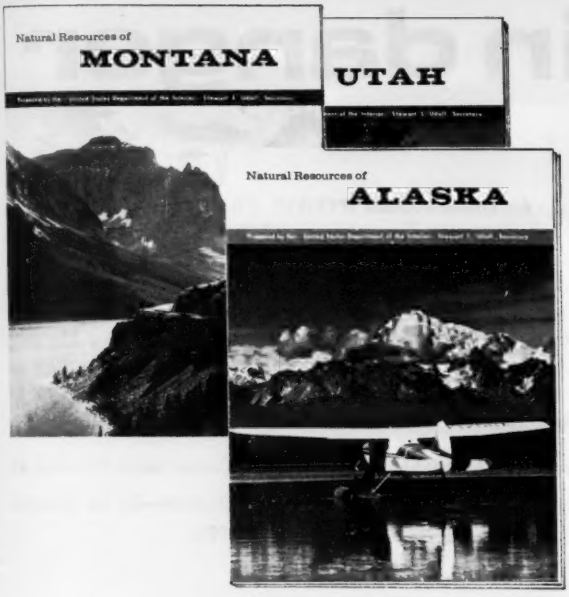
Not all sea water is blue. Water of the Gulf Stream, off the eastern coast of the United States, is a deep blue, but water of a similar current off Japan is so dark that it has been named Kuroshio (Black Stream). In other areas water may be various shades of green, brown, or brownish-red.

The sea is blue for the same reason that the sky is blue. The blue of the sea is caused by scattering of sunlight by tiny particles suspended in the water. Blue light, being of short wave length, is scattered more effectively than light of longer wave lengths.

Although waters of the open ocean are commonly some shade of blue, especially in tropical or subtropical regions, green water is commonly seen near coasts. This is caused by yellow pigments being mixed with blue water. Microscopic floating plants (phytoplankton) are one source of the yellow pigment. Other microscopic plants may color the water brown or brownish-red. Near shore silt or sediment in suspension can give waters a brownish hue; outflow of large rivers can often be observed many miles offshore by the coloration of suspended soil particles.

The color of the sea changes constantly because of clouds passing across the face of the sun or because of the angle of the sun's rays passing through the atmosphere.

Oceanographers record the color of the ocean by comparison with a series of bottles of colored water known as the Forel scale. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)



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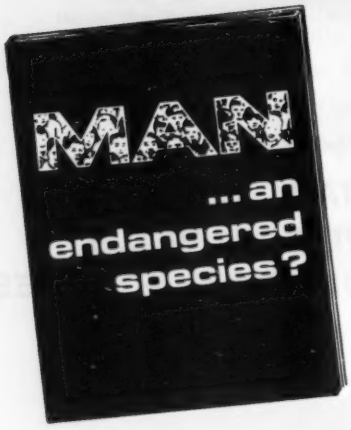

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Nature's Nurseries: The Estuaries

Mouth of the Housatonic River showing Milford Point, the Nells Island marsh area, and the city of Stratford, Connecticut, in the background. (Photo: BCF, Milford, Conn.)

The nutrient-rich waters of the bays, sounds, and nearshore areas that border our coastline serve as nurseries for many important species of fish and shellfish; as a home for waterfowl and furbearing animals; and as a recreational and esthetic resource for man. Salmon, shrimp, shad, menhaden, and other fish and shellfish--which contribute two-thirds of the U.S. commercial fishing catch--come to feed and grow in these natural nurseries until they are ready to move to deeper water as adults. Estuaries are truly the "fish basket" of the Nation.

Estuaries are necessary and desirable for man's use. However, without protection based on sound scientific research, these areas can be damaged irreparably. Already, draining, filling, dredging, and pollution by pesticides and chemical and human wastes have altered drastically some estuarine areas.

Estuaries should be managed to benefit all. BCF works with State and Federal agencies to protect these vital natural resources.

BCF has 2 new films on estuarine resources and conservation: "Estuarine Heritage," and "The Biologist and the Boy." These were made in cooperation with the Gulf States Marine Fisheries Commission using PL 88-309 funds. A catalog of films distributed by the BCF library system can be obtained by writing BCF's Audio-Visual Services Unit, 1815 North Fort Myer Drive, Arlington, Virginia 22209.